

05-28-03

CP 7203

Attorney Docket No. 29195.8171US

Express Mail Label EV343591657USCofc 18  
PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE PATENT APPLICATION No.: 6,197,181

APPLICATION No.: 09/045,245

FILED: MARCH 20, 1998

ISSUED: MARCH 6, 2001

FOR: **METHOD FOR ELECTROLYTICALLY  
DEPOSITING METAL ON A  
MICROELECTRONIC WORKPIECE**PETITION TO CORRECT  
INVENTORSHIP ON  
AN ISSUED PATENT  
UNDER 37 C.F.R. 1.324(B)RECEIVED  
JUN 06 2003  
TC 1700Supervisory Patent Examiner – 1700  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

1. Request for Certificate of Correction

The applicant hereby petitions for a Certificate of Correction to correct the inventorship of U.S. Patent No. 6,197,181 by adding Thomas Taylor as a co-inventor with Dr. Linlin Chen. The correct inventorship should be Dr. Linlin Chen and Thomas Taylor.

2. Statement from Thomas Taylor to be Added as an Inventor

Please find enclosed a statement from Thomas Taylor in which Mr. Taylor declares that the error in failing to include him as an inventor of subject matter claimed in U.S. Patent No. 6,197,181 occurred without any deceptive intent on his part (Exhibit A).

05/28/2003 MBIZUNES 00000066 09045245

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3. Statement from Linlin Chen Agreeing to Correction of Inventorship

Please find enclosed a statement from Dr. Linlin Chen in which Dr. Chen states that he does not disagree to correcting the inventorship by adding Thomas Taylor as a joint inventor of subject matter claimed in U.S. Patent No. 6,197,181 (Exhibit B).

4. Statement from Assignee Agreeing to Correction of Inventorship

Please find enclosed a statement from Mr. William Freeman, an officer of the assignee of U.S. Patent No. 6,197,181, indicating that Semitool agrees to the change of inventorship in this patent (Exhibit C). Also, please find enclosed assignments from Dr. Chen and Mr. Taylor assigning their rights in U.S. Application Serial No. 10/302,701, which is a continuation of U.S. Application No. 09/045,245, to Semitool, Inc (Exhibit D).

5. U.S. Patent No. 6,197,181 Subject Matter of Pending Litigation

U.S. Patent No. 6,197,181 is the subject matter of separate lawsuits between Semitool, Inc. and each of Novellus, Inc., Applied Materials, Inc., and Ebarra, Inc. The inadvertent omission of Thomas Taylor as an inventor of subject matter claimed in the '181 Patent first came to light during a deposition in the pending lawsuits. The facts relevant to Taylor's contribution to subject matter claimed in the '181 Patent and the lack of deceptive intent in failing to name him as an inventor are set forth below.

A. Taylor Conceived and Performed Seed Layer Repair at Semitool Before the Application for the '181 Patent was Filed

In April 1997, Taylor was a team leader of Semitool's Advanced Technology Group ("ATG") and was responsible for developing new technologies for improving seed layers. (See Exhibit E - Taylor Dep. at 77:12 - 80:16; 120:2-22; and Exhibit F - Dep. Ex. 51.) On April 4, 1997, the ATG discussed Semitool's developments in seed layer technology. (Exhibit G - Dep. Ex. 55.) During this ATG meeting, Taylor presented information about Semitool's efforts to improve and optimize seed layers, which expressly included Taylor's ideas for using an electroless process to enhance or repair seed layers.

(Exhibit H - Dep. Ex. 56 at NOVONLY10010, NOVONLY10012; Exhibit E - Taylor Dep. at 121:20- 122:1.) The seed layers to be enhanced were ultra-thin seed layers having a thickness in the range of 200 to 500 Angstroms. (Exhibit H - Dep. Ex. 56 at NOVONLY10012; Exhibit E - Taylor Dep. at 124:25 - 125:12.) The purpose of the electroless enhancement process was to fix deficiencies, such as voids and discontinuities, in the seed layer before using an electroplating procedure to bulk fill copper into recesses. (Exhibit I - Dep. Ex. 53 at ST3081; Exhibit E - Taylor Dep. at 86:25 - 87:7; 101:2 - 102:1.)

Following the April 4 ATG meeting regarding seed layers, Taylor designed experiments to demonstrate the electroless seed layer enhancement process to Intel, which was a Semitool customer. (Exhibit I - Dep. Ex. 53 at ST3081; Exhibit E - Taylor Dep. at 99:3-24; 124:25 - 125:12.) These experiments and demonstrations of the electroless process conceived by Taylor while employed by Semitool were conducted under a confidentiality agreement between Semitool and Intel. (See, e.g., Exhibit I - Dep. Ex. 53 at ST3084 identifying electroless Experiment 6 as "Semitool Confidential.") On May 1, 1997, Taylor sent a memorandum to Intel describing his "proposal to supplement the step coverage of PVD seed layers by a short electroless Cu deposition process prior to beginning electrolytic plating." (Exhibit I - Dep. Ex. 53 at ST3081.) The purpose of the experiment was to "[d]etermine if marginal PVD seed layer step coverage can be improved by supplementary electroless deposition." (*Id.* at ST3082; see also Exhibit J - Dep. Ex. 1053 at ST16468.) According to Taylor, the seed layers were "marginal" because they were "so thin at the bottom as to become intermittently discontinuous or so thin that the plating results were indistinguishable from having a discontinuous seed." (Exhibit E - Taylor Dep. at 101:15-19.) The following day, on May 2, 1997, Taylor presented information about the design of the electroless experiments to Semitool's ATG. (Exhibit K - Dep. Ex. 54; Exhibit E - Taylor Dep. at 112:2-24.) During May 1997, Taylor revised his electroless experiment and sent Intel further memoranda describing the experiment. (Exhibit L - Dep. Ex. 1054; Exhibit E - Taylor Dep. at

139:7 – 140:15; see also Exhibit M - Dep. Ex. 1056 at ST20769-70, ST20776; Exhibit E - Taylor Dep. at 140:22 – 145:21.)

By June 30, 1997, Semitool completed the experiments and prepared a report for Intel. (See Exhibit N - Dep. Ex. 1000.) The results of the experiment showed that the electroless process designed by Taylor was effective in eliminating voids and discontinuities in the seed layer for structures larger than approximately 0.7 microns wide. (Exhibit N - Dep. Ex. 1000 at ST3064; Exhibit E – Taylor Dep. at 136:24 - 137:23.)

LinLin Chen, the named inventor of the '181 patent, began working for Semitool on April 14, 1997. (Exhibit O - Cross Decl., ¶ 8.) Although Chen was not present at the April 4 ATG meeting, he received a copy of the June 30 report describing the results of the electroless seed enhancement experiment designed by Taylor. (See Exhibit N - Dep. Ex. 1000; Exhibit O - Cross Decl., ¶ 8.) Chen received a copy of this report to inform him of Semitool's current activities regarding seed layers and to "solicit [Chen's] feedback on ways that we might improve our development activities." (Exhibit E - Taylor Dep. at 30:22 - 31:5.) Moreover, at ATG meetings or in other discussions at Semitool, Taylor informed Chen of the results of the electroless experiments. (Exhibit E - Taylor Dep. at 112:25 – 114:11.) In late 1997, Chen began focusing on methods to fix deficiencies in seed layers, and on December 22, 1997, he conceived of an electrolytic seed repair process, which is the preferred embodiment of the inventions described in the '181 patent. The application for the '181 patent was filed on March 20, 1998.

B. Taylor was Inadvertently Omitted as a Co-Inventor of the '181 Patent Without Any Deceptive Intent

In mid to late 1997, a number of personnel and organizational changes occurred involving Semitool's ATG and intellectual property department. In mid 1997, Taylor left the ATG and joined Semitool's marketing department. (Exhibit E - Taylor Dep. at 13:7 – 14:2; 95:5-25.) In November, 1997, Mr. Robert Berner,

Corporate Vice President of Technology for Semitool, terminated his employment with Semitool to work for Applied Materials. (Exhibit O - Cross Decl., ¶ 11.) A few months earlier, Semitool's former intellectual property counsel left the company and Mr. Cross, currently Corporate Counsel at Semitool, joined Semitool in September 1997 as a part-time consultant working only three days a week. (Exhibit O - Cross Decl., ¶ 10.) Mr. Cross did not begin working full-time at Semitool until May 1, 1998, more than a month after the application for the '181 patent was filed. (Exhibit O - Cross Decl., ¶ 14.)

As a result of these personnel and organizational changes, Semitool inadvertently lost track of Taylor's work for using an electroless process to repair or enhance thin seed layers. (Exhibit O - Cross Decl., ¶ 14.) Only through discovery taken in this litigation, including Taylor's depositions, did Semitool realize and have an opportunity to confirm that Taylor had made an inventive contribution to the seed repair processes claimed in the '181 patent. (Exhibit O - Cross Decl., ¶ 15.) Because the omission of Taylor as a co-inventor was made without any deceptive intent, Semitool is entitled to have Taylor added as a co-inventor of the '181 patent.

5. Fee under 37 C.F.R. 1.20(b)

Enclosed is a check covering the fee of \$130.00 under 37 C.F.R. § 1.20(b).

6. Additional Fees

Please charge any underpayment of fees for common consideration of this petition to Deposit Account No. 50-0665.

Respectfully submitted,

Perkins Coie LLP

Date: May 23, 2003

PL PL  
Paul T. Parker  
Registration No. 38,264

Enclosures: Exhibits A-O

**Correspondence Address:**

Customer No. 25096  
Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
(206) 583-8888

# Exhibit A



orney Docket No. 291958171US2  
Semitool Ref No. P98-0025US3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Linlin Chen and Thomas Taylor  
Application No.  
and related Patent No. : 10/302,711 and U.S. Patent No. 6,197,181  
Filed : November 22, 2002  
For : APPARATUS AND METHOD FOR  
ELECTROLYTICALLY DEPOSITING COPPER ON A  
SEMICONDUCTOR WORKPIECE  
Docket No. : 291958171US2  
Date : November 22, 2002

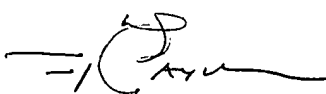
Commissioner for Patents  
Washington, DC 20231

STATEMENT OF THOMAS TAYLOR REGARDING JOINT INVENTORSHIP

Sir:

I, Thomas Taylor, hereby state that the error in failing to include me as an inventor of certain subject matter claimed in U.S. Patent No. 6,197,181 occurred without any deceptive intent on my part.

APRIL 25, 2003  
Date

  
Thomas Taylor



# Exhibit B



Attorney Docket No. 291958171US2  
Semitool Ref No. P98-0025US3

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Linlin Chen and Thomas Taylor

Application No.

and related Patent No. : 10/302,711 and U.S. Patent No. 6,197,181

Filed : November 22, 2002

For : APPARATUS AND METHOD FOR  
ELECTROLYTICALLY DEPOSITING COPPER ON A  
SEMICONDUCTOR WORKPIECE

Docket No. : 291958171US2

Date : November 22, 2002

Commissioner for Patents  
Washington, DC 20231

STATEMENT OF LINLIN CHEN REGARDING JOINT INVENTORSHIP

Sir:

I, Linlin Chen, hereby state that I have no disagreement in regards to the joint inventorship of me and Thomas Taylor with respect to the claimed subject matter for the above-identified application set forth in the Preliminary Amendment filed on November 22, 2002, and in certain claimed subject matter in U.S. Patent No. 6,197,181.

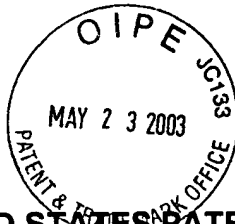
2/10/2003  
Date \_\_\_\_\_  
Linlin Chen \_\_\_\_\_

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JUN 03 2003

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# Exhibit C



**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE PATENT APPLICATION No.: 6,197,181  
APPLICATION No.: 09/045,245  
FILED: MARCH 20, 1998  
ISSUED: MARCH 6, 2001  
FOR: **METHOD FOR ELECTROLYTICALLY  
DEPOSITING METAL ON A  
MICROELECTRONIC WORKPIECE**

**Statement by Assignee Regarding Joint Inventorship and  
Certification  
Under 37 C.F.R. § 3.73(b)**

Supervisory Patent Examiner - 1700  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

I, the undersigned, acting on behalf of the Assignee of the entire right, title and interest in the above-identified patent, by virtue of Assignments filed by Linlin Chen and Thomas Taylor in U.S. Application No. 10/302,711, which is a continuation of U.S. Patent No. 6,197,181, hereby state that the Assignee agrees to the change in inventorship in U.S. Patent No. 6,197,181 to include Linlin Chen and Thomas Taylor.

In accordance with 37 C.F.R. § 3.73(b), I hereby certify that I am empowered to act on behalf of the Assignee. To the best of my knowledge and belief, title is in the Assignee, as evidenced by the Assignments noted above.

I further declare that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, USC § 1001 and that such willful false statements may jeopardize the validity of this application or any patent resulting therefrom.

ASSIGNEE: Semitool, Inc.

**RECEIVED**  
JUN 03 2003

Signature:

William R. Freeman

Typed Name:

William Freeman

Title:

Senior Vice President, Finance and CFO

Date:

\_\_\_\_\_

Address:

P. O. Box 7010, Kalispell, MT 59904-0010

# Exhibit D


**ASSIGNMENT**

THIS ASSIGNMENT is by Linlin Chen and Thomas Taylor (the "Assignors"), residing at 3213 Placid Springs Lane, Plano TX 75025, and 308 SW Montgomery Street #206, Portland, OR 97201, respectively. We Assignors have invented one or more certain inventions described in a United States Patent Application entitled APPARATUS AND METHOD FOR ELECTROLYTICALLY DEPOSITING COPPER ON A SEMICONDUCTOR WORKPIECE (the "Application") and ☐ executed concurrently herewith; or ☒ filed on November 22, 2002 as Application No. 10/302,711 (the "Invention(s)"). We Assignors authorize the Assignee, identified below, or its representatives to insert the filing date and application number of the Application when known.

Semitool, Inc., a corporation of the State of Montana having a place of business at 655 West Reserve Drive, Kalispell MT 59901 ("Assignee"), desires to acquire the entire right, title and interest in and to the Invention(s) and the Application, and in and to any patents (collectively, "Patents") that may be granted for the Invention(s) in the United States or in any foreign countries.

For valuable consideration, the receipt and sufficiency of which we acknowledge, Assignors hereby sell, assign, and transfer to Assignee, its successors, legal representatives and assigns, the entire right, title and interest in and to: the Invention(s), the Application, and any Patents; any divisions, continuations, and continuations-in-part of the Application and any other application claiming priority rights from the Application; any reissues, reexaminations, or extensions of any and all Patents; the right to file foreign applications directly in the name of Assignee; and the right to claim priority rights deriving from the Application (collectively, the "Rights"). Assignors warrant that they are joint owners of the Rights, and that the Rights are unencumbered. Assignors also agree to not sign any writing or do any act conflicting with this assignment, and, without further compensation, sign all documents and do such additional acts as Assignee deems necessary or desirable to: perfect Assignee's enjoyment of the Rights; prepare and prosecute the Application or any other applications for Patents; conduct proceedings regarding the Rights, including any litigation or interference proceedings; or perfect or defend title to the Rights. Assignors request the Commissioner of Patents to issue any Patent of the United States that may be issued on the Invention(s) to Assignee. This Assignment may be executed in counterparts.

Date: 2/10/2003

  
 \_\_\_\_\_  
 Linlin Chen

STATE OF \_\_\_\_\_  
 COUNTY OF \_\_\_\_\_

On \_\_\_\_\_ before me personally appeared Linlin Chen, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity, and that by his/her signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

(Seal)

\_\_\_\_\_  
 Signature

\* \* \* \* \*

Date: \_\_\_\_\_

\_\_\_\_\_  
 Thomas Taylor

STATE OF \_\_\_\_\_  
 COUNTY OF \_\_\_\_\_

On \_\_\_\_\_ before me personally appeared Thomas Taylor, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity, and that by his/her signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

(Seal)

\_\_\_\_\_  
 Signature

\* \* \* \* \*



**ASSIGNMENT**

THIS ASSIGNMENT is by Linlin Chen and Thomas Taylor (the "Assignors"), residing at 3213 Placid Springs Lane, Plano TX 75025, and 308 SW Montgomery Street #206, Portland, OR 97201, respectively. We Assignors have invented one or more certain inventions described in a United States Patent Application entitled APPARATUS AND METHOD FOR ELECTROLYTICALLY DEPOSITING COPPER ON A SEMICONDUCTOR WORKPIECE (the "Application") and ☐ executed concurrently herewith; or ☒ filed on November 22, 2002 as Application No. 10/302,711 (the "Invention(s)"). We Assignors authorize the Assignee, identified below, or its representatives to insert the filing date and application number of the Application when known.

Semitool, Inc., a corporation of the State of Montana having a place of business at 655 West Reserve Drive, Kalispell MT 59901 ("Assignee"), desires to acquire the entire right, title and interest in and to the Invention(s) and the Application, and in and to any patents (collectively, "Patents") that may be granted for the Invention(s) in the United States or in any foreign countries.

For valuable consideration, the receipt and sufficiency of which we acknowledge, Assignors hereby sell, assign, and transfer to Assignee, its successors, legal representatives and assigns, the entire right, title and interest in and to: the Invention(s), the Application, and any Patents; any divisions, continuations, and continuations-in-part of the Application and any other application claiming priority rights from the Application; any reissues, reexaminations, or extensions of any and all Patents; the right to file foreign applications directly in the name of Assignee; and the right to claim priority rights deriving from the Application (collectively, the "Rights"). Assignors warrant that they are joint owners of the Rights, and that the Rights are unencumbered. Assignors also agree to not sign any writing or do any act conflicting with this assignment, and, without further compensation, sign all documents and do such additional acts as Assignee deems necessary or desirable to: perfect Assignee's enjoyment of the Rights; prepare and prosecute the Application or any other applications for Patents; conduct proceedings regarding the Rights, including any litigation or interference proceedings; or perfect or defend title to the Rights. Assignors request the Commissioner of Patents to issue any Patent of the United States that may be issued on the Invention(s) to Assignee. This Assignment may be executed in counterparts.

Date: \_\_\_\_\_

Linlin Chen

STATE OF \_\_\_\_\_

COUNTY OF \_\_\_\_\_

On \_\_\_\_\_ before me personally appeared Linlin Chen, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity, and that by his/her signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

(Seal)

\_\_\_\_\_  
Signature

\*\*\*\*\*

Date: April 25, 2003

Thomas Taylor

STATE OF MASSACHUSETTS

COUNTY OF MIDDLESEX

On April 25, 2003 before me personally appeared Thomas Taylor, personally known to me (or proved to me on the basis of satisfactory evidence) to be the person whose name is subscribed to the within instrument and acknowledged to me that he/she executed the same in his/her authorized capacity, and that by his/her signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

WITNESS my hand and official seal.

(Seal)

M. Frank Rizella  
Signature  
Expires June 12, 2009

\*\*\*\*\*

# Exhibit E

# CONDENSED TRANSCRIPT

IN THE UNITED STATES DISTRICT COURT  
FOR THE DISTRICT OF OREGON

SEMITOOL, INC.,  
Plaintiff,

vs.

NOVELLUS SYSTEMS, INC.,  
Defendant.



No. 16-01-06060

**HIGHLY CONFIDENTIAL**

**VIDEOTAPED DEPOSITION OF**

**THOMAS TAYLOR**

**VOLUME II**

October 23, 2002  
9:15 a.m.

6011 SW Second Avenue  
Suite 1600  
Portland, Oregon

Carol Ann Nevarez, Certified Shorthand Reporter for Oregon

**Alexander Gallo Associates, Inc.**  
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1 IN THE UNITED STATES DISTRICT COURT

2 FOR THE DISTRICT OF OREGON

3 SEMITool, INC., ) No. 01-CV-1066-BR

4 Plaintiff, )

5 vs. )

6 APPLIED MATERIALS, INC., )

7 Defendant. )

8 -----)

9 SEMITool, INC., ) No. 01-CV-873-BR

10 Plaintiff, )

11 vs. )

12 EBARA CORPORATION and EBARA )

13 TECHNOLOGIES, INC., )

14 Defendants. )

15 -----)

16 SEMITool, INC., ) No. 01-CV-874-BR

17 Plaintiff, )

18 vs. )

\*\*\*\*CONTAINS\*\*\*\*

19 NOVELLUS SYSTEMS, INC., ) HIGHLY CONFIDENTIAL

20 Defendant. ) \*\*\*INFORMATION\*\*\*

21  
22 VIDEOTAPED DEPOSITION OF THOMAS TAYLOR

23 Taken in behalf of Defendant Novellus Systems, Inc.

24 March 25, 2002

25 Portland, Oregon

HIGHLY  
CONFIDENTIAL

1 BE IT REMEMBERED that the videotaped  
2 deposition of THOMAS TAYLOR was taken in behalf of  
3 Defendant Novellus Systems, Inc., pursuant to the  
4 Federal Rules of Civil Procedure, before Bonita J.  
5 Alexander, Certified Shorthand Reporter for Oregon,  
6 on Monday, the 25th day of March, 2002, in the law  
7 offices of Perkins Coie LLP, 1211 S.W. Fifth Avenue,  
8 Suite 1500, Portland, Oregon, commencing at the hour  
9 of 9:50 a.m.

11 APPEARANCES

12 PERKINS COIE LLP

13 By: Mr. Jerry A. Riedinger and Mr.  
14 Paul T. Fortino, appearing in behalf  
15 of the Plaintiff;  
16

17 WEIL, GOTSHAL & MANGES LLP

18 By: Mr. Jared Bobrow, appearing in  
19 behalf of Defendant Applied Materials,  
20 Inc.;  
21

22 FISH & NEAVE

23 By: Mr. Terrence J.P. Kearney,  
24 appearing in behalf of Defendant Ebara  
25 Corporation;

CONFIDENTIAL  
HIGHLY

1 IRELL & MANELLA LLP

2 By: Mr. Roman Melnik, appearing in  
3 behalf of Defendant Novellus Systems,  
4 Inc.  
5

6 SEMITOOL, INC.

7 By: Mr. Harry Cross, In-House  
8 Counsel.  
9

10 ALSO PRESENT

11 William Thoma, Limelight Video Productions  
12  
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25

1 INDEX  
2 DEPOSITION OF THOMAS TAYLOR  
3 Examination by Mr. Melnik 6

4  
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7 -oOo-  
8 \*\*\* NO EXHIBITS MARKED \*\*\*  
9 -oOo-  
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1 THE VIDEOGRAPHER: This is Volume 1, 09:50:14  
2 tape 1 in the deposition of Tom Taylor, in the 09:50:16  
3 matter of Semitool vs. Novellus Systems, 09:50:18  
4 Case No. 01-CV-874-BR; also Semitool vs. Applied 09:50:21  
5 Materials, 01-CV-1066-BR; and also Semitool vs. 09:50:27  
6 Ebara Technologies, Inc., 01-CV-873-BR. 09:50:34  
7 Today's date is March 25th, 2002. The 09:50:41  
8 time on the video monitor is 9:50 a.m. The video 09:50:45  
9 operator today is William Thoma, contracted by 09:50:50  
10 Legalink Los Angeles, at 16830 Ventura Boulevard, 09:50:53  
11 Encino, California. 09:50:58  
12 This video deposition is taking place at 09:51:00  
13 Perkins Coie, 1211 Southwest Fifth, Portland, 09:51:02  
14 Oregon, and was noticed by Roman Melnik of Irell & 09:51:06  
15 Manella. 09:51:09  
16 Counsel, please voice identify yourselves 09:51:11  
17 and state whom you represent. 09:51:13  
18 MR. MELNIK: Roman Melnik of Irell for 09:51:15  
19 Novellus Systems. 09:51:18  
20 MR. BOBROW: Jared Bobrow of Weil, Gotshal 09:51:19  
21 for Applied Materials. 09:51:20  
22 MR. KEARNEY: Terry Kearney of Fish & 09:51:23  
23 Neave, for Ebara Corporation. 09:51:25  
24 MR. RIEDINGER: Jerry Riedinger from 09:51:27  
25 Perkins Coie for Semitool. And also with me is 09:51:28

1 1984, at the time that I got my degree, if you 09:56:25  
2 recall, and went to work for an organization called 09:56:29  
3 FSI for a very short period of time, six months, was 09:56:34  
4 recruited away to Sperry, in Eagan, Minnesota, as a 09:56:38  
5 process development engineer. 09:56:44  
6 Sperry was acquired by Burroughs. I went 09:56:49  
7 to Cray Research in Chippewa Falls, Wisconsin from 09:56:53  
8 1986, roughly, to 1989. 09:57:00  
9 In 1989 I took a position with a company 09:57:06  
10 called Ramtron International Corporation. 09:57:09  
11 You smile. 09:57:13  
12 Q. No, I'm only smiling because you have a 09:57:13  
13 rather long employment -- unusually long employment 09:57:17  
14 history. 09:57:20  
15 A. It has been 24 years, but you're right, 09:57:21  
16 there are a number. 09:57:23  
17 Q. Please go ahead. 09:57:24  
18 A. At Ramtron my position was to lead a team 09:57:25  
19 developing a specialty DRAM fabrication technology 09:57:28  
20 for a company called NMBS Semiconductor in Tateyama, 09:57:34  
21 Japan. That was an 18-month stint. 09:57:40  
22 At the conclusion of that, I went to work 09:57:43  
23 for Ramtron in Colorado Springs for -- until 1996. 09:57:45  
24 In the spring of 1996, took the position with 09:57:58  
25 Semitool in Kalispell, Montana, was there until the 09:58:01

10

1 spring of 1999, at which time I went to work for 09:58:04  
2 Rohm & Hass Company and its subsidiaries, Shipley 09:58:11  
3 and Rodel. 09:58:15  
4 Q. Now, do you remember exactly when in 1996 09:58:16  
5 you joined Semitool? 09:58:21  
6 A. I do recall -- I'm sorry, I could have 09:58:23  
7 brought that, but it was the autumn of 1996. 09:58:26  
8 Q. Autumn of 1996. And do you remember 09:58:28  
9 exactly when during the autumn of 1996? 09:58:31  
10 A. I'm sorry, I don't remember precisely, 09:58:34  
11 exactly what month it was. 09:58:37  
12 Q. Do you remember early versus late autumn? 09:58:39  
13 A. I remember that there was frost on the 09:58:41  
14 pumpkins. I was in my temporary -- this was perhaps 09:58:45  
15 summertime, late summer as opposed to fall, but that 09:58:51  
16 was approximately when it was. 09:58:54  
17 Q. Late summer-early fall? 09:58:57  
18 A. Yeah. 09:58:59  
19 Q. Or possibly a little later? 09:58:59  
20 A. (Witness nods head.) 09:59:01  
21 Q. And do you remember exactly when you left 09:59:01  
22 Semitool? 09:59:09  
23 A. My recollection is the end of -- beginning 09:59:09  
24 of April of 1999. 09:59:12  
25 Q. I think you described this a little bit 09:59:22

11

1 already, but just -- I was taking notes and perhaps 09:59:23  
2 I wasn't listening as carefully as I should have 09:59:26  
3 been. Can you describe in a little more detail your 09:59:28  
4 work at Ramtron for me. 09:59:31  
5 A. At Ramtron I started as the manager of 09:59:33  
6 process development, took a role after approximately 09:59:36  
7 two years as the director of technology alliances, 09:59:44  
8 and held that position until I departed. This is in 09:59:47  
9 Colorado Springs, of course. 09:59:51  
10 Q. And as director of technology alliances, 09:59:55  
11 was that primarily an R and D job or primarily a 09:59:58  
12 marketing-type job? 10:00:02  
13 A. It was an add mixture of the two. It was 10:00:03  
14 a role in which I was responsible for developing 10:00:06  
15 contractual arrangements between Ramtron and 10:00:13  
16 large-scale manufacturers for the transfer of 10:00:16  
17 Ramtron's proprietary ferroelectric memory 10:00:19  
18 technology, which required a fairly in-depth 10:00:24  
19 knowledge as to the details of that technology and 10:00:26  
20 how it might be implemented in the CMOS baseline 10:00:28  
21 structures of a variety of partners. And it also, 10:00:35  
22 of course, required a certain amount of technical 10:00:38  
23 marketing as well. 10:00:40  
24 Q. Did your responsibilities at Ramtron 10:00:46  
25 relate in any way to electroplating or electroless 10:00:50

12

1 deposition? 10:00:57  
2 A. None. 10:00:57  
3 Q. I'm sorry, was the answer "none"? 10:00:59  
4 A. The answer was none. The answer was that 10:01:00  
5 none of those responsibilities related to 10:01:04  
6 electroplating or electroless technology. 10:01:07  
7 Q. When you started at Semitool, whatever the 10:01:18  
8 time frame was, early fall of 1996, do you recall 10:01:22  
9 what your first job responsibility was? 10:01:29  
10 A. AI? 10:01:32  
11 Q. Semitool. 10:01:34  
12 A. Yes. My responsibilities were as the 10:01:36  
13 process development manager, and I was tasked with 10:01:38  
14 overseeing the activities of a group of process 10:01:44  
15 development engineers working in both electroplating 10:01:48  
16 and in single-substrate wet chemical processing, 10:01:51  
17 cleaning solvent and acid cleaning and so forth, 10:01:55  
18 etching. 10:01:58  
19 Q. And for how long did you remain process 10:02:18  
20 development manager at Semitool? 10:02:20  
21 A. For approximately nine months, and -- 10:02:22  
22 well, approximately nine months. 10:02:27  
23 Q. And when did you change positions, and 10:02:28  
24 what was your next position? 10:02:33  
25 A. Approximately nine months after I arrived, 10:02:34

13

1 Mr. Paul Fortino from Perkins Coie, and Mr. Harry 09:51:32  
2 Cross, corporate counsel for Semitool. 09:51:35  
3 THE VIDEOGRAPHER: The court reporter is 09:51:38  
4 Bonita Alexander of Beovich Walter & Friend. 09:51:39  
5 Would the court reporter please swear in 09:51:42  
6 the witness. 09:51:43  
7 09:51:44

8 THOMAS TAYLOR  
9 called as a witness in behalf of Defendant  
10 Novellus Systems, Inc., being first duly sworn, is  
11 examined and testifies as follows:  
12

13 EXAMINATION

14 BY MR. MELNIK: 09:51:52

15 Q. Mr. Taylor, would you please state your 09:51:53  
16 full name and address for the record, please. 09:51:55

17 A. My name is Thomas Charles Taylor. My 09:51:57  
18 address is 0308 Southwest Montgomery, Apartment 09:51:59  
19 No. 206, Portland, Oregon. 09:52:04

20 Q. Mr. Taylor, are you being represented by a 09:52:07  
21 lawyer in today's deposition? 09:52:11

22 A. No. I'm here without the benefit of 09:52:12  
23 counsel. 09:52:14

24 Q. You have -- do you understand that you 09:52:16  
25 have the right to bring a lawyer to the deposition? 09:52:16

6

1 take a position working in Japan prior to completing 09:53:42  
2 thesis work, so that was incomplete. 09:53:45  
3 I'm currently in the Ph.D. program at 09:53:46  
4 Portland State University, in the discipline called 09:53:49  
5 systems science. 09:53:52  
6 Q. Since you didn't have a lawyer, who told 09:53:54  
7 you about -- Let me ask this. Is this your first 09:54:05  
8 deposition? 09:54:07  
9 A. First ever. 09:54:07  
10 Q. I guess I should give you a little bit of 09:54:08  
11 background on how these things work. You notice to 09:54:11  
12 the left there's a court reporter who is taking down 09:54:13  
13 what you and I are saying, and there's also a 09:54:15  
14 videographer over there videotaping you. The most 09:54:18  
15 important part of this is because we're doing a 09:54:22  
16 written transcript, it's important not to do what 09:54:24  
17 normal people do, which is to nod and make 09:54:28  
18 nonverbal -- and give nonverbal answers. It's 09:54:32  
19 important to say yes or no, rather than huh-uh, 09:54:35  
20 uh-huh, or something like that. 09:54:38  
21 A. If you catch me, please correct me. 09:54:40  
22 Q. I will try. And vice versa. I do it, 09:54:42  
23 too. 09:54:45  
24 Also, it's important so that we can all go 09:54:46  
25 home at a reasonable hour, including most 09:54:51

8

1 A. I do. 09:52:20  
2 Q. And you would like to proceed without a 09:52:21  
3 lawyer? 09:52:23  
4 A. I would. 09:52:23  
5 Q. At some point prior to today's deposition, 09:52:23  
6 were you contacted by the Perkins Coie law firm 09:52:31  
7 about representing you at this deposition? 09:52:35  
8 A. Perkins Coie offered to represent me, as 09:52:37  
9 did, in fact, the attorneys for Shipley Company, 09:52:42  
10 with whom I was employed following my tenure at 09:52:45  
11 Semitool. 09:52:49

12 Q. And what was your response? 09:52:50

13 A. At the time I appreciated the offer, did 09:52:50  
14 not make a commitment, and chose effectively about 09:52:54  
15 two weeks ago to proceed without official 09:52:58  
16 representation. 09:53:01

17 Q. Mr. Taylor, can you please tell me about 09:53:01  
18 your educational background, beginning with college, 09:53:14  
19 please. 09:53:20

20 A. Certainly. I graduated from the 09:53:20  
21 University of Utah in 1984 with a baccalaureate in 09:53:22  
22 chemical engineering, a bachelor of science in 09:53:27  
23 chemical engineering, proceeded in 1989 to pursue a 09:53:31  
24 master's in materials science at the University of 09:53:35  
25 Minnesota while employed at Cray Research, chose to 09:53:37

7

1 importantly you, that you listen carefully to the 09:54:53  
2 questions that I ask and answer those questions so 09:54:55  
3 that I don't have to repeat my questions several 09:55:02  
4 times, because the way people normally speak to each 09:55:04  
5 other is they listen to the context of the question 09:55:08  
6 and respond to the context. Lawyers frequently, not 09:55:10  
7 being people, don't pose questions that way, they 09:55:14  
8 tend to pose questions in a very particular narrow 09:55:18  
9 way, and it's important to listen to the exact 09:55:21  
10 questions being asked before you answer. 09:55:23  
11 A. I understand. 09:55:24  
12 Q. Okay. So can you please tell me now your 09:55:24  
13 employment history, starting with your first job and 09:55:36  
14 going up to your time at Shipley. 09:55:42  
15 A. Yes. The first job -- the first job in 09:55:44  
16 this industry was in 1977, at Motorola, what was at 09:55:50  
17 that time called NMOS, prior to the formation of 09:55:57  
18 their silicon product sector. 09:55:59  
19 Following that, worked for six years at 09:56:01  
20 National Semiconductor in Salt Lake City in both 09:56:06  
21 engineering and production management roles. 09:56:13  
22 Q. When did you leave Motorola? 09:56:16  
23 A. 19 -- late 1978. 09:56:17  
24 Q. Go ahead, please. 09:56:20  
25 A. I was at National Semiconductor through 09:56:22

9



<p>1 transcript confidential. 10:09:09</p> <p>2 A. Confidential to whom? 10:09:10</p> <p>3 Q. In other words, none of us can tell our 10:09:12</p> <p>4 clients. Only the lawyers would know. There's a 10:09:18</p> <p>5 court order in place. 10:09:20</p> <p>6 A. That involves Intel confidential 10:09:22</p> <p>7 information? 10:09:25</p> <p>8 Q. Anybody's confidential information that 10:09:25</p> <p>9 would be listed in this lawsuit pursuant -- as part 10:09:27</p> <p>10 of discovery or subpoenas. So, you have to answer 10:09:30</p> <p>11 the question, but I think with all the other 10:09:34</p> <p>12 lawyers' agreement, we'll just designate that 10:09:37</p> <p>13 portion highly confidential. 10:09:41</p> <p>14 A. Anything that involves Intel or any other 10:09:42</p> <p>15 customer who's not a party to this suit, then I'd 10:09:46</p> <p>16 ask that to be the case. 10:09:48</p> <p>17 Q. Yes, we will designate that highly 10:09:49</p> <p>18 confidential. 10:09:52</p> <p>19 MR. MELNIK: I wonder if for this portion, 10:09:53</p> <p>20 Mr. Cross, if it's going to be highly 10:09:55</p> <p>21 confidential -- 10:09:57</p> <p>22 MR. RIEDINGER: Well, the question that 10:09:57</p> <p>23 precedes it is whether this was information that was 10:09:58</p> <p>24 already in the possession of Semitool. There's not 10:10:01</p> <p>25 reason for Mr. Cross to leave if this was 10:10:05</p> <p style="text-align: right;">18</p>	<p>1 of the transcript highly confidential. 10:11:03</p> <p>2 A. Thank you. 10:11:07</p> <p>3 Q. I can't tell Novellus, Mr. Bobrow can't 10:11:07</p> <p>4 tell Applied and so on. 10:11:09</p> <p>5 A. Understood. 10:11:11</p> <p>6 MR. RIEDINGER: Well, to be fair, the 10:11:12</p> <p>7 protective order does allow certain consultants 10:11:13</p> <p>8 hired for the litigation, once they've agreed to 10:11:16</p> <p>9 comply with the terms of the protective order, to 10:11:19</p> <p>10 get access as well. 10:11:21</p> <p>11 THE WITNESS: I understand that as well. 10:11:23</p> <p>12 MR. MELNIK: I didn't mean to modify the 10:11:24</p> <p>13 protective order. I was just trying to summarize. 10:11:26</p> <p>14 BY MR. MELNIK: (continuing) 10:11:28</p> <p>15 Q. Now, let's see if you can answer the 10:11:28</p> <p>16 question. 10:11:30</p> <p>17 A. Restate the question, please. 10:11:30</p> <p>18 Q. Okay, sorry. 10:11:33</p> <p>19 Was the idea essentially that Intel would 10:11:34</p> <p>20 give Semitool the wafers, and in exchange, Semitool 10:11:37</p> <p>21 would share with Intel the results of the 10:11:42</p> <p>22 experiments? 10:11:44</p> <p>23 MR. RIEDINGER: Since we're moving into 10:11:45</p> <p>24 substantive stuff, I will start interposing 10:11:47</p> <p>25 objections to leading questions. And so on this one 10:11:49</p> <p style="text-align: right;">20</p>
<p>1 information that was Intel information provided. 10:10:05</p> <p>2 MR. MELNIK: That's a fair point. 10:10:06</p> <p>3 BY MR. MELNIK: (continuing) 10:10:08</p> <p>4 Q. You knew this information at the time you 10:10:08</p> <p>5 were at Semitool, the information you're about to 10:10:10</p> <p>6 tell us? 10:10:12</p> <p>7 A. I'm sorry, you're going to have to restate 10:10:13</p> <p>8 your question. 10:10:16</p> <p>9 Q. I'm sorry. Okay. The Intel confidential 10:10:17</p> <p>10 information that you're concerned about, is this 10:10:21</p> <p>11 information you knew at the time you were a Semitool 10:10:24</p> <p>12 employee? 10:10:27</p> <p>13 A. That is going to depend on the specifics 10:10:27</p> <p>14 of the question. 10:10:30</p> <p>15 Q. Okay. To the extent that it was 10:10:33</p> <p>16 information that you knew when you were a Semitool 10:10:35</p> <p>17 employee, I agree that Mr. Cross does not have to 10:10:38</p> <p>18 leave. If you're going to tell us something that is 10:10:40</p> <p>19 Intel confidential information that you didn't know 10:10:43</p> <p>20 at the time you were at Semitool -- 10:10:48</p> <p>21 A. I wouldn't. 10:10:50</p> <p>22 Q. Okay. Well, let's cross that bridge when 10:10:51</p> <p>23 we come to it. 10:10:56</p> <p>24 A. Fair enough. 10:10:57</p> <p>25 Q. Okay. Now, we'll designate this portion 10:10:58</p> <p style="text-align: right;">19</p>	<p>1 I do object to the form of the question as leading. 10:11:51</p> <p>2 BY MR. MELNIK: (continuing) 10:11:55</p> <p>3 Q. Okay. Since you haven't been prepared, I 10:11:56</p> <p>4 guess I should tell you how this works. You still 10:11:57</p> <p>5 have to answer my question, but after Mr. Riedinger 10:12:00</p> <p>6 makes his objection. 10:12:03</p> <p>7 A. Fine. 10:12:05</p> <p>8 The idea was that we would demonstrate the 10:12:05</p> <p>9 efficacy of an electroplating process on Intel's 10:12:09</p> <p>10 wafers with and without the use of an electroless 10:12:12</p> <p>11 deposition preceding the bulk deposition of copper. 10:12:16</p> <p>12 Q. And share those results with Intel? 10:12:22</p> <p>13 A. Absolutely. 10:12:24</p> <p>14 Q. Do you recall if at the time you 10:12:35</p> <p>15 characterized these experiments as evaluating 10:12:39</p> <p>16 electroless enhancement of marginal PVD seed layers? 10:12:45</p> <p>17 A. Yes, I recall that. In fact, that was the 10:12:50</p> <p>18 principal reason for evaluating an electroless 10:12:55</p> <p>19 process, was the feeling that the seed layer that 10:12:59</p> <p>20 Intel was providing was, in fact, marginal and 10:13:04</p> <p>21 incapable of being filled with an electroplating 10:13:07</p> <p>22 process alone. 10:13:10</p> <p>23 Q. And what did you mean by marginal in that 10:13:11</p> <p>24 time frame? 10:13:16</p> <p>25 A. Discontinuous, not continuously 10:13:16</p> <p style="text-align: right;">21</p>

<p>1 I took a position as the director of marketing for 10:02:38</p> <p>2 what was at the time the ECD division. 10:02:43</p> <p>3 Q. I'm wondering if we can now triangulate 10:02:51</p> <p>4 your start date based on the date in which you 10:02:54</p> <p>5 changed positions and subtracting nine months. 10:02:56</p> <p>6 Thinking about it now, does that help you remember 10:03:00</p> <p>7 when you started? 10:03:02</p> <p>8 A. No, it doesn't. 10:03:03</p> <p>9 Q. You just remember it was a nine-month 10:03:03</p> <p>10 delta? 10:03:08</p> <p>11 A. Yes, approximately a nine-month delta. 10:03:08</p> <p>12 Q. And what were your responsibilities as 10:03:24</p> <p>13 director of marketing? 10:03:25</p> <p>14 A. To develop collateral demonstrating the 10:03:26</p> <p>15 utility of Semitool's approach to electroplating 10:03:29</p> <p>16 copper, to build on the early infrastructure, I 10:03:33</p> <p>17 guess, that existed, the early system placements 10:03:40</p> <p>18 that Semitool enjoyed, to particularly, though, to 10:03:46</p> <p>19 focus on the introduction of a new tool architecture 10:03:49</p> <p>20 that replaced what was an earlier sort of derivative 10:03:54</p> <p>21 design from other single-substrate processing 10:03:58</p> <p>22 applications. Customer presentations featured very 10:04:00</p> <p>23 importantly. 10:04:11</p> <p>24 Q. Was there a name for this new tool 10:04:14</p> <p>25 architecture you mentioned? 10:04:16</p> <p>14</p>	<p>1 Q. Do you remember doing a demo or a number 10:05:45</p> <p>2 of demos called Experiment 5 and Experiment 6 for 10:06:09</p> <p>3 Intel in the May-June 1997 time frame? 10:06:14</p> <p>4 A. I remember that. 10:06:16</p> <p>5 Q. Whose suggestion was it to do that work 10:06:18</p> <p>6 for Intel? Did the suggestion come from Intel or 10:06:30</p> <p>7 from you? 10:06:34</p> <p>8 A. My recollection is that it was developed 10:06:35</p> <p>9 as a consequence of dialogue, but whether it came 10:06:39</p> <p>10 specifically from an Intel employee or from a 10:06:43</p> <p>11 Semitool employee, I do not recall. 10:06:47</p> <p>12 Q. Do you remember a similar set of 10:07:04</p> <p>13 experiments being run in the same time frame for 10:07:05</p> <p>14 Leti? 10:07:09</p> <p>15 MR. RIEDINGER: I'm sorry. 10:07:10</p> <p>16 MR. MELNIK: Leti, L-E-T-I. I won't try 10:07:11</p> <p>17 to sound out the French name. 10:07:15</p> <p>18 THE WITNESS: I do not recall the details. 10:07:17</p> <p>19 That is -- it sounds familiar, but I am not 10:07:20</p> <p>20 recalling the details of that as clearly as I am for 10:07:23</p> <p>21 the work done for domestic potential customers. 10:07:26</p> <p>22 BY MR. MELNIK: (continuing) 10:07:31</p> <p>23 Q. Do you remember where the wafers came from 10:07:40</p> <p>24 on which Experiment 5 and Experiment 6 for Intel 10:07:43</p> <p>25 were done? 10:07:46</p> <p>16</p>
<p>1 A. The tool that was introduced to the market 10:04:17</p> <p>2 was -- the name under which it was introduced was 10:04:19</p> <p>3 LT210. 10:04:23</p> <p>4 Q. And I'm sorry, you said that the focus of 10:04:31</p> <p>5 your work with the LT210 was in electroplating 10:04:33</p> <p>6 copper, or did I misunderstand? 10:04:38</p> <p>7 A. No, you didn't. The earlier tools had 10:04:40</p> <p>8 broad applications, electroplating being one of 10:04:43</p> <p>9 them. The LT210 was specifically focused as a 10:04:45</p> <p>10 electroplating system. It ultimately gave rise to 10:04:49</p> <p>11 other applications, but its principal application 10:04:52</p> <p>12 upon design and introduction was for electroplating. 10:04:54</p> <p>13 Q. And do you remember when it was 10:04:58</p> <p>14 introduced? 10:05:00</p> <p>15 A. The dates, no, I do not. 10:05:00</p> <p>16 Q. Do you remember the rough time period? 10:05:01</p> <p>17 A. Roughly in mid 1997. Roughly Semicon West 10:05:05</p> <p>18 time frame. 10:05:14</p> <p>19 Q. And do you remember, did its functionality 10:05:24</p> <p>20 change drastically over the next year or so or did 10:05:29</p> <p>21 the LT210 stay pretty much the same? 10:05:33</p> <p>22 A. There were a number of enhancements, but 10:05:36</p> <p>23 if we're talking about its fundamental purpose to 10:05:38</p> <p>24 electroplate copper on semiconductor devices, then 10:05:41</p> <p>25 it remained the same. 10:05:44</p> <p>15</p>	<p>1 A. Where the wafers came from? Process 10:07:46</p> <p>2 development experimentation frequently employs 10:07:58</p> <p>3 wafers from a variety of sources. Feasibility 10:08:00</p> <p>4 studies, as an example, often employ very 10:08:03</p> <p>5 inexpensive, readily available, internally 10:08:07</p> <p>6 fabricated structures. Others that are done 10:08:10</p> <p>7 specifically to demonstrate compatibility with a 10:08:14</p> <p>8 customer's structures come from customers. My 10:08:16</p> <p>9 recollection is that the Intel demos were of that 10:08:19</p> <p>10 nature. 10:08:23</p> <p>11 Q. That the wafers were given to Semitool by 10:08:24</p> <p>12 Intel? 10:08:28</p> <p>13 A. That a fraction of the wafers were given 10:08:28</p> <p>14 to Semitool by Intel. 10:08:30</p> <p>15 Q. And was the idea basically that Intel 10:08:38</p> <p>16 would give Semitool the wafers, and then in exchange 10:08:41</p> <p>17 Semitool would share with Intel the results of the 10:08:44</p> <p>18 experiments? 10:08:47</p> <p>19 A. I don't believe that I am at liberty to 10:08:47</p> <p>20 discuss Intel's expectations or even their 10:08:50</p> <p>21 preparations and instructions with respect to 10:08:54</p> <p>22 customer demos of Semitool. 10:08:56</p> <p>23 Q. Let me see if we can try this. To the 10:08:59</p> <p>24 extent that you remember them, you have to tell us, 10:09:02</p> <p>25 although we will designate that portion of the 10:09:06</p> <p>17</p>

1 at least in some cases the ability to deposit on top 10:18:26  
2 of a preexisting seed layer. But their principal 10:18:28  
3 focus was either to deposit the copper in full 10:18:32  
4 thickness by electroless technology or, absent that, 10:18:36  
5 depositing the seed layer itself by electroless 10:18:39  
6 technology, absent the requirement of doing a PVD 10:18:43  
7 copper deposition. 10:18:46  
8 Q. And the process sequence where one 10:18:47  
9 deposits the electroless copper on top of a PVD or 10:18:50  
10 CVD seed prior to a fill step, is that sometimes 10:18:56  
11 called seed repair or seed enhancement? 10:19:00  
12 A. Yes, it's been referred to that way. 10:19:02  
13 Q. Do you recall if the papers you saw from 10:19:04  
14 Leti or from IMEC, did those papers deal with 10:19:21  
15 copper? 10:19:26  
16 A. Those papers were specifically related to 10:19:26  
17 copper. That was one of the criteria for the 10:19:30  
18 search, if I recall correctly. 10:19:33  
19 Q. You might have said this before, but I 10:19:37  
20 missed it, so I apologize. Do you remember when you 10:19:39  
21 did this search? I know you said it was at 10:19:42  
22 Semitool, but - 10:19:45  
23 A. It was at Semitool, and it was prior to 10:19:45  
24 doing the demonstrations for Intel. 10:19:47  
25 Q. Let me show you what has previously been 10:20:52

26

1 marked in this case as Exhibit 1000. I'll just 10:20:56  
2 write "Exhibit 1000" in the corner. 10:21:01  
3 MR. RIEDINGER: Is that a copy of the same 10:21:05  
4 document that was previously marked as 1000? 10:21:09  
5 MR. MELNIK: Yes. It just doesn't have 10:21:11  
6 the court reporter's stamp on it. 10:21:14  
7 MR. RIEDINGER: Thank you. 10:21:15  
8 BY MR. MELNIK: (continuing) 10:21:16  
9 Q. And if you could take a look at this 10:21:18  
10 document and see if you remember it. 10:21:20  
11 A. Yes. 10:22:04  
12 Q. Yes, you do remember it? 10:22:05  
13 A. Yes, I remember this. 10:22:07  
14 Q. Was this sort of the final summary report 10:22:09  
15 for the work for Intel that we've just been 10:22:14  
16 discussing? 10:22:16  
17 MR. RIEDINGER: Objection, leading. 10:22:17  
18 THE WITNESS: I don't recall that this was 10:22:17  
19 the final summary report. This could have been. 10:22:19  
20 The way that this is written, I would tend to 10:22:22  
21 characterize this as an interim document. 10:22:26  
22 BY MR. MELNIK: (continuing) 10:22:30  
23 Q. It was a report relating to the 10:22:31  
24 electroless seed layer enhancement work that we've 10:22:34  
25 been discussing? 10:22:37

27

1 A. Prima facie, "Subject: Seed layer 10:22:37  
2 enhancement through electroless plating," yes. 10:22:40  
3 Q. Fair enough. 10:22:43  
4 Who, other than - Well, let me back up. 10:22:46  
5 You participated - you were one of the people who 10:22:48  
6 participated in the design of this experiment? 10:22:51  
7 A. Yes. 10:22:53  
8 Q. Who other than yourself participated in 10:22:55  
9 the design of this experiment? 10:22:57  
10 A. My recollection is that the individuals 10:22:58  
11 that are noted here on the copy list: Henry 10:23:02  
12 Stevens, Jeff Turner, Linlin Chen, also Tom 10:23:05  
13 Ritzdorf. I do not Bob Berner having been involved 10:23:08  
14 in substantive discussions on this topic. Shu Jin 10:23:13  
15 of Intel, Chun Mu of Intel were also involved. 10:23:17  
16 Chun Mu and I had independent or 10:23:20  
17 individual discussions one on one on this topic 10:23:23  
18 outside of the group discussions. 10:23:28  
19 Q. What was Henry Stevens' role? 10:23:37  
20 A. Henry was - Henry Stevens was acting as, 10:23:39  
21 at the time, a consultant. He, I believe, although 10:23:42  
22 that would have to go back to Semitool's records, I 10:23:47  
23 believe that we ultimately brought him on board as a 10:23:50  
24 full-time employee, but for some period of time my 10:23:53  
25 again recollection is that especially during 1997, 10:23:58

28

1 he was working as a consultant on process 10:24:01  
2 development. 10:24:05  
3 Q. And specifically with respect to this 10:24:06  
4 experiment, what was his role in terms of designing 10:24:10  
5 this experiment? 10:24:13  
6 A. I don't recall his specific input. 10:24:14  
7 Q. What about Jeff Turner? Do you recall 10:24:16  
8 anything specific that he did with respect to this 10:24:24  
9 experiment? 10:24:25  
10 A. Jeff's role was not necessarily 10:24:25  
11 conceptualizing the approach, but managing Matt 10:24:30  
12 Johnson's implementation of it. Jeff was 10:24:34  
13 functioning as the principal engineer, laboratory 10:24:36  
14 manager. He oversaw the utilization of the 10:24:40  
15 equipment, made sure that tool time availability and 10:24:42  
16 system configuration was such that we could get 10:24:47  
17 experiments done in a logical sequence. 10:24:49  
18 Q. And I gather from your last answer that 10:24:52  
19 Matt Johnson is the person that actually did the 10:24:55  
20 experiment? 10:24:57  
21 A. That's again my recollection, and it was 10:24:57  
22 consistent with our approach at the time, in that 10:25:00  
23 the engineer who conducted the experiment would be 10:25:02  
24 the one who summarized the results. 10:25:04  
25 Q. And with respect to, I guess, should that 10:25:06

29

1 electrically conductive through its entire 10:13:20  
2 cross-section. 10:13:24  
3 Q. And do you mean, to the extent that you do 10:13:37  
4 remember, that the CVD seed that Leti was providing, 10:13:39  
5 do you remember if that was also discontinuous in 10:13:43  
6 the same way? 10:13:46  
7 A. I do not, in that Leti was performing 10:13:47  
8 independent experimentation on electroless processes 10:13:54  
9 and may have had an interest in the technology aside 10:13:57  
10 from its ability to heal or improve seed layers. 10:13:59  
11 Q. And when you say that Leti was performing 10:14:06  
12 independent experiments in electroless technology, 10:14:08  
13 do you mean that they were doing electroless seed 10:14:12  
14 repair or electroless fill? 10:14:14  
15 A. I don't know the scope of their 10:14:17  
16 activities, but I seem to recall papers that have 10:14:18  
17 been published and in the public domain that 10:14:21  
18 indicated that they were evaluating both options. 10:14:24  
19 Q. Do you remember who the authors were or 10:14:29  
20 where you might have seen the papers? 10:14:30  
21 A. I do not know exactly who the authors 10:14:32  
22 were. I do know the authors -- this is not a 10:14:34  
23 question you've asked, so I'll wait until you do. 10:14:37  
24 Q. Okay. Do you know who the authors were? 10:14:40  
25 A. No. 10:14:42

22

1 Q. Do you know where you saw the papers? 10:14:43  
2 A. During a period of literature searching 10:14:46  
3 while I was employed at Semitool, because I was at 10:14:50  
4 the time unfamiliar with the details of electroless 10:14:53  
5 technology, and it was part of an attempt to come up 10:14:57  
6 to speed. 10:15:02  
7 Q. I'm sorry, I guess that was an ambiguous 10:15:02  
8 question. When I asked where, I really meant what 10:15:05  
9 journal or conference proceeding. 10:15:07  
10 A. Not off the top of my head, no. No, I do 10:15:09  
11 not. 10:15:11  
12 Q. Do you have copies of those papers? 10:15:11  
13 A. No, I do not. 10:15:13  
14 Q. Is there anything else that you could tell 10:15:14  
15 me that would help me locate those papers? 10:15:16  
16 A. Only that my recollection is that they 10:15:17  
17 were published in the 1995-1996 time frame. I 10:15:22  
18 believe that they were published in European as 10:15:30  
19 opposed to U.S. journals, or perhaps in conference 10:15:34  
20 proceedings. That's the extent of it. To the best 10:15:37  
21 of my recollection, those are papers that remained 10:15:44  
22 at Semitool when I departed, to the best of my 10:15:50  
23 recollection. 10:15:56  
24 Q. Oh, so you had copies of those papers and 10:15:56  
25 you left them at Semitool when you left? 10:16:00

23

1 A. Along with all my other documentation. 10:16:00  
2 Q. And just so that we close the circle on 10:16:03  
3 this, your best recollection is that the authors of 10:16:07  
4 the papers were researchers of Leti Grenoble? 10:16:09  
5 MR. RIEDINGER: Objection, leading. 10:16:15  
6 THE WITNESS: My best recollection is that 10:16:17  
7 there were papers that were published by Leti. I do 10:16:19  
8 not know Leti Gressi's (phonetic) actual location. 10:16:22  
9 I do not know if it was in Grenoble, their Grenoble 10:16:28  
10 facility. 10:16:32  
11 I guess I will supplement this by saying 10:16:33  
12 at the same time I ran across papers by a gentleman 10:16:35  
13 named Dr. Roger Palmans of IMEC, and it is 10:16:39  
14 conceivable that I am getting the two mixed up in my 10:16:43  
15 mind, but I do recall, I believe, that there were 10:16:46  
16 papers both by Leti and by IMAC. 10:16:48  
17 BY MR. MELNIK: (continuing) 10:16:51  
18 Q. Can you spell Dr. Palmans' last name? 10:16:51  
19 A. P-a-l-m-a-n-s. 10:16:54  
20 Q. And IMEC is I-M-E-C? 10:16:59  
21 A. Correct. 10:17:02  
22 Q. And what does IMEC stand for, do you know? 10:17:03  
23 A. It is Belgian, and it basically stands for 10:17:04  
24 the Institute of Microelectronic Research, but it is 10:17:08  
25 in Flemish or something. 10:17:11

24

1 Q. And your recollection is that one or both 10:17:16  
2 of these sets of papers described electroless seed 10:17:19  
3 repair and electroless fill? 10:17:23  
4 MR. RIEDINGER: Objection, leading. Lacks 10:17:25  
5 foundation. 10:17:27  
6 THE WITNESS: My recollection is that they 10:17:29  
7 concentrated on electroless fill, highlighted some 10:17:31  
8 of the drawbacks, and as supplementary comments 10:17:34  
9 indicated that, nonetheless, despite filling 10:17:38  
10 appeared to have its challenges, that the technology 10:17:43  
11 could be employed for depositing a seed layer, not 10:17:47  
12 necessarily as a seed layer repair, but to deposit a 10:17:51  
13 seed layer. 10:17:55  
14 BY MR. MELNIK: (continuing) 10:17:55  
15 Q. And when you say "deposit a seed layer," 10:18:00  
16 do you mean on top of a discontinuous PVD/CVD seed 10:18:03  
17 or do you mean on top of a barrier? 10:18:08  
18 A. Both. 10:18:10  
19 MR. RIEDINGER: Compound question. 10:18:11  
20 BY MR. MELNIK: (continuing) 10:18:12  
21 Q. I'm sorry, your answer was both? 10:18:12  
22 A. Principal focus was the ability to deposit 10:18:13  
23 a seed layer on a barrier, though there were, my 10:18:17  
24 recollection -- and remember this is several years 10:18:20  
25 old, my recollection is that they had also evaluated 10:18:22

25

1 be in some cases mutually binding. 10:32:07  
 2 BY MR. MELNIK: (continuing) 10:32:14  
 3 Q. During 1997, were you a member of the ATG 10:32:15  
 4 group? 10:32:23  
 5 A. Advanced technology group, of course. 10:32:23  
 6 Q. Advanced technology group. 10:32:26  
 7 And was Dr. Chen also a member? 10:32:29  
 8 A. Yes. 10:32:32  
 9 Q. When you did the literature search that we 10:32:33  
 10 were discussing and you located the Leti and the 10:32:40  
 11 IMEC papers, did you give copies of those papers to 10:32:45  
 12 other members of the advanced technology group? 10:32:51  
 13 A. I don't remember exactly how the 10:32:53  
 14 information was disseminated. I am sure that I 10:32:55  
 15 discussed it and the contents with Tom Ritzdorf. I 10:32:58  
 16 do not recall whether any of these other individuals 10:33:03  
 17 were explicitly copied. 10:33:05  
 18 Q. Do you remember if you wrote any memos 10:33:11  
 19 about these papers or did you just discuss them 10:33:13  
 20 orally with Mr. Ritzdorf? 10:33:17  
 21 A. I don't recall -- 10:33:18  
 22 MR. RIEDINGER: Objection to the form of 10:33:19  
 23 the -- 10:33:20  
 24 THE WITNESS: I'm sorry, please go ahead. 10:33:21  
 25 MR. RIEDINGER: You need to give me just a 10:33:23

34

1 perspective on process development and chemistry 10:34:51  
 2 development. 10:35:00  
 3 Q. Who, when you left Semitool, who inherited 10:35:02  
 4 your -- Well, let me back up. 10:35:10  
 5 You said you kept these papers. Did you 10:35:11  
 6 have sort of a prior art file or binder or something 10:35:13  
 7 like that where you kept literature that you found 10:35:16  
 8 interesting? 10:35:19  
 9 A. I had a number of file cabinets in my 10:35:19  
 10 office at the time. 10:35:23  
 11 Q. And when you left Semitool for Shipley, 10:35:24  
 12 who inherited those? 10:35:27  
 13 A. I don't know who inherited them. 10:35:29  
 14 Q. You didn't leave them to anyone 10:35:30  
 15 specifically? 10:35:32  
 16 A. I did not leave them to anyone 10:35:32  
 17 specifically. They were left behind in my office. 10:35:34  
 18 And in the course of three years, there were a 10:35:39  
 19 number of file purges. My recollection is that 10:35:41  
 20 those kind of documents would have made the cut, so 10:35:43  
 21 to speak, of significant documents that would have 10:35:46  
 22 been retained, but it's entirely possible that they 10:35:49  
 23 may have been purged. 10:35:51  
 24 Q. Did you do this literature search by 10:35:57  
 25 computer? 10:36:00

36

1 short time to get the objection in. 10:33:25  
 2 THE WITNESS: I apologize. 10:33:27  
 3 MR. BOBROW: I couldn't hear the answer. 10:33:27  
 4 MR. MELNIK: Yeah, I couldn't either. 10:33:27  
 5 (The record is read, as requested.) 10:33:33  
 6 BY MR. MELNIK: (continuing) 10:33:39  
 7 Q. Maybe you could repeat your answer. 10:33:40  
 8 A. Would you repeat the question, please. 10:33:42  
 9 Q. Sure. 10:33:44  
 10 The question was whether in discussing 10:33:45  
 11 these papers with at least Mr. Ritzdorf, whether 10:33:47  
 12 that discussion was oral or whether you wrote him 10:33:50  
 13 one or more memos. 10:33:53  
 14 A. I don't recall. 10:33:55  
 15 Q. What helps you remember that you discussed 10:34:06  
 16 the results of the literature search with Tom 10:34:09  
 17 Ritzdorf specifically? 10:34:11  
 18 A. Principally because Tom Ritzdorf and I 10:34:13  
 19 discussed mutual discoveries or learning, 10:34:16  
 20 "discoveries" meaning findings of prior art or our 10:34:23  
 21 own thinking on topics with respect to chemistry 10:34:26  
 22 development in particular, to the best of my 10:34:34  
 23 knowledge, across the board, every time. Tom 10:34:40  
 24 Ritzdorf was unquestionably the individual that I 10:34:42  
 25 relied upon most from the standpoint of a technical 10:34:45

35

1 A. Partially by computer, absolutely. 10:36:00  
 2 Q. I'm just trying to retrace your steps. If 10:36:02  
 3 I went back and tried to find these papers, do you 10:36:05  
 4 have any suggestions for how I might be able to do 10:36:07  
 5 it or what key words I should use? 10:36:09  
 6 A. "Electroless copper" would certainly be a 10:36:11  
 7 key word. "Semiconductor applications" would be 10:36:14  
 8 another one. "Damascene" would be a third, 10:36:19  
 9 naturally. 10:36:22  
 10 This is only one of easily two dozen 10:36:22  
 11 literature searches that were taking place over that 10:36:26  
 12 span of time, and I again have a hard time 10:36:28  
 13 distinguishing this one from others that were taking 10:36:32  
 14 place either before or after or at the same time. 10:36:34  
 15 Q. Do you remember what databases you were 10:36:36  
 16 using? 10:36:38  
 17 A. No, I don't, no, as I sit here. 10:36:39  
 18 Q. Do you remember what databases were 10:36:53  
 19 available at Semitool for you to use? 10:36:55  
 20 A. We were -- I do not recall whether we were 10:36:57  
 21 subscribing to specific databases that were fee 10:37:03  
 22 based or whether we were simply using databases that 10:37:05  
 23 were uncovered during public domain searches. 10:37:09  
 24 Q. Did you ever file or -- Let me back up. 10:37:50  
 25 Were you ever named inventor on any patent 10:37:56

37

10

1 be Linlin Chen, rather than Chin in the cc line? 10:25:11  
 2 A. Yes. 10:25:14  
 3 Q. Do you recall what Dr. Chen's involvement 10:25:14  
 4 was, if any, with respect to the initial design of 10:25:22  
 5 this experiment or was he just -- 10:25:27  
 6 A. I'm sorry. 10:25:33  
 7 MR. RIEDINGER: Compound, two questions. 10:25:34  
 8 THE WITNESS: Memory is fallible, as I'm 10:25:36  
 9 sure you already appreciate. My recollection is 10:25:38  
 10 that Dr. Chen had only been on board at Semitool for. 10:25:40  
 11 a relatively short period of time. His focus was 10:25:44  
 12 not specifically on electroless or on seed layer 10:25:47  
 13 repair. He was and is a Ph.D. electrochemist who. 10:25:52  
 14 was frequently copied on many of the process 10:25:59  
 15 development activities as a way of keeping him on 10:26:01  
 16 board, in the loop, and also to get the benefit of 10:26:04  
 17 his background, but my recollection is that for 10:26:06  
 18 these series of experiments, he had little or no 10:26:10  
 19 direct involvement in the design or the 10:26:13  
 20 implementation. 10:26:15  
 21 BY MR. MELNIK: (continuing) 10:26:15  
 22 Q. So, the purpose of cc'ing him on this memo 10:26:16  
 23 was because he would find this interesting? 10:26:21  
 24 MR. RIEDINGER: Objection, leading. 10:26:23  
 25 THE WITNESS: The purpose of copying him 10:26:26

30

1 that kind of a constraint. I do not recall. My 10:28:58  
 2 recollection; however, is that any work done 10:29:03  
 3 collaboratively with Intel, that we were explicitly 10:29:07  
 4 forbidden to disseminate the results, with the 10:29:14  
 5 understanding that they would also keep the results 10:29:17  
 6 internal. But whether this particular experiment 10:29:20  
 7 called for a restatement of that understanding, I 10:29:27  
 8 don't recall. 10:29:29  
 9 Q. Were there sometimes -- were there times 10:29:30  
 10 when experiments were done with an understanding 10:29:36  
 11 that the results could be disseminated? 10:29:40  
 12 A. Typically it's those circumstances that 10:29:44  
 13 were explicitly identified, that the default was 10:29:49  
 14 that unless experimental results were specifically 10:29:53  
 15 identified as being disseminatable, that in fact 10:29:57  
 16 they would by default not be. 10:30:01  
 17 Q. And how was such identification made? In 10:30:03  
 18 other words, would a particular document be labeled 10:30:08  
 19 "Semitool confidential" and the like? 10:30:12  
 20 A. Yes. 10:30:13  
 21 Q. I guess that's what I'm sort of puzzling 10:30:15  
 22 over. As far as I can tell -- and maybe you can 10:30:17  
 23 correct me -- as I look over Exhibit 1000, I didn't 10:30:21  
 24 see any preexisting stamps, as opposed to stuff that 10:30:24  
 25 lawyers put on it, that said that this was 10:30:29

32

1 on this memo was not only to facilitate his uptake 10:26:27  
 2 on the scope of activities that were underway in 10:26:32  
 3 process development, but also to solicit his 10:26:35  
 4 feedback on any ways that we might improve our 10:26:38  
 5 development activities. 10:26:41  
 6 BY MR. MELNIK: (continuing) 10:26:42  
 7 Q. And who on the Intel side, other than the 10:26:42  
 8 two individuals listed here, Shu Jin and Chun Mu, 10:27:23  
 9 were involved in interacting with Semitool with 10:27:28  
 10 respect to these experiments? 10:27:31  
 11 A. My recollection is that we had occasional 10:27:32  
 12 discussions involving Jack Yu, but whether Jack was 10:27:43  
 13 engaged in this experimental design, I do not 10:27:50  
 14 recall. It would have been, however, 10:27:54  
 15 contemporaneous with this. 10:27:57  
 16 Q. Could you spell his name for us? 10:27:58  
 17 A. J-i-c-k, Y-u. 10:27:59  
 18 Q. Was it a he? 10:28:05  
 19 A. It is a he. 10:28:05  
 20 Q. It is a he. 10:28:06  
 21 Did you ask the people at Intel not to 10:28:31  
 22 disseminate the experimental results that you 10:28:37  
 23 communicated to them as part of Experiment 6? 10:28:40  
 24 A. I do not recall whether we highlighted 10:28:42  
 25 this particular work as being explicitly subject to 10:28:52

31

1 confidential. Does that help you remember whether 10:30:31  
 2 this experiment could have been disseminated by 10:30:34  
 3 Intel or not? 10:30:37  
 4 A. No, it doesn't. 10:30:37  
 5 Q. And why not? 10:30:38  
 6 A. Why doesn't it help me remember? 10:30:41  
 7 Q. (Nods head.) 10:30:44  
 8 A. I don't know. 10:30:45  
 9 Q. If you were still at Semitool and you 10:30:59  
 10 wanted to go back and figure out whether Intel was 10:31:02  
 11 free to disseminate this particular set of 10:31:06  
 12 experiments, what would you try to look up or what 10:31:12  
 13 documents would you try to dig out? 10:31:16  
 14 MR. RIEDINGER: Hypothetical. 10:31:18  
 15 THE WITNESS: I don't know how to answer 10:31:20  
 16 that. In cases where a formal joint development 10:31:21  
 17 agreement existed, it would be specifically 10:31:29  
 18 highlighted. In other cases where there was a 10:31:31  
 19 statement of understanding or what would -- Intel 10:31:36  
 20 would refer to as a CITR, which is a confidential 10:31:40  
 21 information transfer or transmittal report, that 10:31:46  
 22 would also constitute another piece of 10:31:50  
 23 documentation. But any discussions with Intel on 10:31:52  
 24 process development activities, their typical 10:31:59  
 25 approach is to issue a CITR, which is considered to 10:32:01

33

1 the early work, did not demonstrate equivalent 10:45:21  
2 success, but nevertheless were anticipated that 10:45:25  
3 they, with further development, might So 10:45:29  
4 consequently the claims were written to cast as 10:45:32  
5 broad a net as possible. 10:45:35  
6 BY MR. MELNIK: (continuing) 10:45:36  
7 Q. Do you remember if Dr. Chen did 10:46:30  
8 electroless seed repair experiments – do you 10:46:32  
9 remember if Dr. Chen did any electroless seed repair 10:46:37  
10 experiments? 10:46:40  
11 A. I remember that Dr. Chen used chemistries 10:46:41  
12 that were very similar to conventional electroless 10:46:47  
13 chemistries, but whether they were employed in a 10:46:51  
14 conventional electroless deposition process, I do 10:46:53  
15 not remember. 10:46:56  
16 Q. And the preferred embodiment that you 10:46:56  
17 spoke about just a moment ago, did you have an 10:47:04  
18 alkaline electrolytic seed repair process in mind? 10:47:08  
19 A. That is, to the best of my recollection, 10:47:12  
20 one of the options that was explored with 10:47:17  
21 chemistries that are – in many cases have parallels 10:47:22  
22 to electroless processes, electroless formulations. 10:47:26  
23 Q. What is your basis for thinking that the 10:47:45  
24 work that was done earlier in 1997, like that 10:47:55  
25 described in Exhibit 1000, influenced Dr. Chen's 10:47:59

42

1 later work that led up to the '181 patent? 10:48:04  
2 A. What is the basis? 10:48:07  
3 Q. Funny lawyer way of saying really how do 10:48:14  
4 you know. 10:48:16  
5 A. How do I know. I was not a co-inventor of 10:48:17  
6 this, but was involved in a number of different 10:48:21  
7 roles, not only during the 1997 time frame, though 10:48:26  
8 shortly thereafter – you said we were going to 10:48:31  
9 triangulate on time frames – shortly thereafter 10:48:33  
10 moving into a marketing role, but then at the 10:48:35  
11 conclusion of my tenure at Semitool was the general 10:48:38  
12 manager of the group and was involved, though not in 10:48:42  
13 exhaustive detail, in discussions related to the 10:48:50  
14 patent estate. And I recall that discussions on the 10:48:56  
15 importance of a seed layer – 10:48:59  
16 MR. RIEDINGER: I want you to continue to 10:49:02  
17 answer, but I'd like to advise you that Semitool has 10:49:04  
18 not waived its attorney-client privilege in this 10:49:07  
19 case, and so we do not believe it's appropriate for 10:49:09  
20 you to reveal the substance of communications by 10:49:13  
21 Semitool's attorneys that may have been made to you, 10:49:17  
22 including communications about the strategy and so 10:49:20  
23 forth in Semitool's patent applications. You can 10:49:24  
24 describe the existence of such communications and 10:49:28  
25 who participated and dates, but not the substance, 10:49:30

43

1 please. 10:49:33  
2 THE WITNESS: All right. Thank you. 10:49:33  
3 Discussions as to the potential 10:49:35  
4 applicability of electroless-like chemistries for 10:49:38  
5 seed layer repair took place in the context of the 10:49:43  
6 work that Dr. Chen did, discussions in which I, Tom 10:49:47  
7 Ritzdorf and Dr. Chen were involved. 10:49:52  
8 BY MR. MELNIK: (continuing) 10:49:55  
9 Q. And this was during what time frame? I'm 10:49:55  
10 sorry. 10:49:57  
11 A. This would have been at the period of time 10:49:57  
12 when Dr. Chen was doing the bulk of his work leading 10:50:01  
13 up to the filing for this patent. So this would 10:50:05  
14 have been in the '90 – I'm sorry. 10:50:08  
15 Q. Let me see if I can help you. The filing 10:50:17  
16 date of the patent is March 20th, 1998. 10:50:19  
17 A. So this would have been in the late '97 10:50:22  
18 time frame. 10:50:24  
19 Q. And did you feel at the time you were 10:50:25  
20 having these discussions with Tom Ritzdorf and 10:50:45  
21 Linlin Chen that Dr. Chen had invented the concept 10:50:50  
22 of seed layer repair generally? 10:50:54  
23 MR. RIEDINGER: Objection, calls for an 10:50:59  
24 opinion. 10:51:00  
25 THE WITNESS: My recollection is that 10:51:13

44

1 Dr. Chen invented the embodiment that is described 10:51:17  
2 in this patent, but the concept of seed layer repair 10:51:20  
3 actually grew out of a concept for a broader 10:51:28  
4 technology of ECDC layer, a replacement for PVD, 10:51:33  
5 which involved discussions and input that included 10:51:38  
6 those from Tom Ritzdorf, from myself, from Henry 10:51:46  
7 Stevens, et al. 10:51:50  
8 BY MR. MELNIK: (continuing) 10:51:51  
9 Q. And when you say ECDC layer, do you mean 10:51:52  
10 direct on-barrier deposition of a seed layer? 10:51:59  
11 A. Yes. That's one of the names that it goes 10:52:01  
12 by. 10:52:04  
13 Q. And the reason why one grew out of the 10:52:04  
14 other – Well, let me back up. 10:52:08  
15 During – let's take an alkaline 10:52:13  
16 electrolytic process for depositing directly on 10:52:17  
17 barrier. Is there a point early in that process 10:52:20  
18 when the state of nucleation is such that you 10:52:24  
19 essentially have a bunch of little copper eyelets on 10:52:30  
20 the barrier? 10:52:32  
21 MR. RIEDINGER: Objection, lacks 10:52:33  
22 foundation. 10:52:34  
23 THE WITNESS: The process that you 10:52:35  
24 described is extremely sensitive to the surface 10:52:40  
25 state of the barrier itself, and therefore 10:52:46

45

1 applications that Semitool filed with respect to the 10:37:59  
2 work described in Exhibit 1000? 10:38:04  
3 A. I do not believe that I was ever a named 10:38:05  
4 inventor on work that was related to electroless 10:38:12  
5 plating. 10:38:16  
6 Q. Do you know if Semitool ever filed any 10:38:19  
7 patent applications on electroless seed repair? 10:38:21  
8 A. I do not know that that happened. 10:38:24  
9 Q. Do you know if Semitool filed any patent 10:38:33  
10 applications on work that included the Intel 10:38:36  
11 experiments described in Exhibit 1000? 10:38:42  
12 A. My recollection is that at the time that a 10:38:58  
13 patent application was filed describing seed repair 10:39:08  
14 technology, per se, that it was clear that this was 10:39:14  
15 one of the approaches that had been pursued, and 10:39:18  
16 consequently was -- influenced the way the claims 10:39:24  
17 were written. 10:39:27  
18 Q. When you say that this was one of the 10:39:33  
19 approaches, are you referring to electroless seed 10:39:36  
20 repair? 10:39:39  
21 A. Yes. 10:39:39  
22 Q. And when you say that it had been pursued, 10:39:39  
23 do you mean pursued by people such as, for example, 10:39:43  
24 the Leti workers and Professor Palmans out in the 10:39:48  
25 open literature? 10:39:53

38

1 A. No. I mean that it was pursued 10:39:53  
2 internally, explicitly for the purposes of seed 10:39:58  
3 repair in the context of, as an example, customer 10:40:02  
4 demonstrations, such as the one described in 10:40:06  
5 Exhibit 1000. 10:40:09  
6 Q. And which seed repair application -- 10:40:15  
7 patent applications did you have in mind in your 10:40:25  
8 previous answer? 10:40:27  
9 MR. RIEDINGER: Objection, foundation. 10:40:28  
10 THE WITNESS: I'm sorry, but the one that 10:40:29  
11 led to this issued patent, '6197, et cetera. 10:40:31  
12 BY MR. MELNIK: (continuing) 10:40:34  
13 Q. The Chen '181 patent? 10:40:34  
14 A. Yes. 10:40:37  
15 MR. MELNIK: Have we marked this 10:40:40  
16 previously as Exhibit 1? 10:40:41  
17 MR. BOBROW: Plaintiff's Exhibit 1. 10:40:44  
18 MR. MELNIK: Plaintiff's Exhibit 1. 10:40:49  
19 Let me mark as Exhibit 1037, I think is 10:41:33  
20 our next number -- actually, no, wait a minute. 10:41:36  
21 This was marked before. My apologies. If I can 10:41:42  
22 find what its previous number was. 10:41:45  
23 BY MR. MELNIK: (continuing) 10:41:49  
24 Q. Let me give you what has previously been 10:41:49  
25 marked as Exhibit 1002, Semitool's supplemental 10:41:51

39

1 responses to Applied Materials' first set of 10:42:01  
2 interrogatories. And I will just point you to 10:42:04  
3 interrogatory No. 3, and if you could just skim the 10:42:10  
4 question and answer. 10:42:14  
5 A. No. 3. 10:42:14  
6 MR. RIEDINGER: Do you have an additional 10:42:19  
7 copy for me, Mr. Melnick? 10:42:21  
8 MR. MELNIK: (Handing.) 10:42:25  
9 MR. RIEDINGER: Thank you. 10:42:26  
10 BY MR. MELNIK: (continuing) 10:42:26  
11 Q. You can stop after the line that says 10:43:06  
12 "Jeff Turner." 10:43:09  
13 A. Well, thank you. 10:43:10  
14 Q. The rest is just lawyer stuff. 10:43:12  
15 You'll notice that Semitool has identified 10:43:25  
16 you as a person who is -- who possibly has some 10:43:27  
17 knowledge regarding the conception and reduction to 10:43:34  
18 practice of the '181 patent. 10:43:37  
19 In your view how, if at all, did the -- 10:43:39  
20 this work that we were discussing in Exhibit 1000, 10:43:45  
21 the electroless seed repair work, influence 10:43:49  
22 Dr. Chen's later work that led up to the '181 10:43:52  
23 patent? 10:43:56  
24 MR. RIEDINGER: Calls for an opinion. It 10:43:56  
25 assumes facts not testified to. 10:44:01

40

1 THE WITNESS: That objection having been 10:44:03  
2 made, I assume that the prior understanding still 10:44:06  
3 exists, and that I -- 10:44:08  
4 BY MR. MELNIK: (continuing) 10:44:09  
5 Q. Yes. 10:44:09  
6 MR. RIEDINGER: You do answer after -- 10:44:10  
7 THE WITNESS: That's quite all right. 10:44:11  
8 MR. RIEDINGER: -- I place my objection on 10:44:13  
9 the record. It's for later use. 10:44:14  
10 THE WITNESS: Thank you. 10:44:15  
11 My recollection is that it was among the 10:44:16  
12 variety of techniques that were available, described 10:44:20  
13 in different applications in detail in the 10:44:25  
14 literature that were part of the electro deposition 10:44:27  
15 repertoire that were understood by people skilled in 10:44:36  
16 the art; that the work Dr. Chen did in leading up to 10:44:40  
17 this '181 patent investigated a number of those and 10:44:43  
18 variants of those. 10:44:49  
19 And my further recollection is that in 10:44:50  
20 writing patent claims, that it was important to make 10:44:53  
21 them as broadly applicable as possible. There was a 10:45:01  
22 -- there is a preferred embodiment that is described 10:45:03  
23 in detail in this '181 patent. It was the 10:45:06  
24 embodiment that was found to be best. Others that 10:45:11  
25 were explored did not demonstrate, at least during 10:45:15

41



1 experiments, some on Ti nitride, some on tantalum 11:13:18  
 2 nitride, some work better than others. What is it 11:13:23  
 3 that motivated you from the results of those 11:13:27  
 4 experiments to now go to seed repair? 11:13:29  
 5 A. Direct on-barrier plating is motivated by 11:13:36  
 6 two things: one is the elimination of the 11:13:42  
 7 requirement to have a separate process for barrier 11:13:45  
 8 deposition; and the second – the second one was 11:13:50  
 9 because of the inadequacy of the existing processes, 11:13:54  
 10 the fact that high-aspect ratio features were very 11:13:59  
 11 frequently imperfectly coated, covered, sheathed by 11:14:03  
 12 PVD deposition, which makes the electroplating 11:14:08  
 13 process look as though it has flaws, when in fact 11:14:12  
 14 those flaws were a preexisting condition. 11:14:15  
 15 So the whole motivation for direct 11:14:18  
 16 on-barrier plating, that was the Holy Grail, so to 11:14:20  
 17 speak. Seed layer repair was a Dixie cup. It was 11:14:25  
 18 an acknowledgment that if the overall seed layer 11:14:31  
 19 process itself couldn't be eliminated, that at least 11:14:36  
 20 the flaws in it could be ameliorated by a process 11:14:41  
 21 that was of the nature described here. 11:14:45  
 22 So, the whole motivation for it is that if 11:14:48  
 23 you couldn't get a home run by eliminating the 11:14:51  
 24 requirement for the barrier altogether, or more 11:14:56  
 25 specifically the seed layer, the PVD-deposited seed 11:14:58

50

1 discontinuities in the PVD seed was the conceptual 11:16:25  
 2 parallel, as it were, between seed layer repair work 11:16:29  
 3 and direct on-barrier work. 11:16:32  
 4 A. I would have to say yes, the idea was that 11:16:36  
 5 you were attempting to cover up an exposed barrier, 11:16:41  
 6 in some cases very small and localized. In the 11:16:45  
 7 direct on-barrier plating, obviously over the entire 11:16:50  
 8 surface. 11:16:52  
 9 Q. Do you remember Pat Burkhardt? 11:16:56  
 10 A. Pat Burkhardt? The name is familiar. 11:16:58  
 11 You'd have to provide a context. 11:17:01  
 12 Q. He was, I believe, a lawyer at Semitool in 11:17:02  
 13 1997. 11:17:05  
 14 A. Oh, yes, I remember Pat Burkhardt. 11:17:05  
 15 Q. Did you work with Pat under some 11:17:08  
 16 circumstances during 1997? 11:17:17  
 17 A. I had a number of discussions with Pat 11:17:18  
 18 both – yes, worked with Pat. 11:17:21  
 19 Q. Did those discussions relate generally to 11:17:25  
 20 patent applications? 11:17:30  
 21 A. Generally, yes. 11:17:31  
 22 Q. Did any of them relate to patent 11:17:32  
 23 applications on which you were a named inventor? 11:17:34  
 24 A. I do not recall specifically what patent 11:17:39  
 25 applications I was a named inventor on, as opposed 11:17:51

52

1 layer altogether, at least you could avoid having 11:15:02  
 2 the electroplating process results hampered by a 11:15:04  
 3 poor seed layer deposition process. 11:15:09  
 4 Q. And was the logical connection between the 11:15:12  
 5 two the fact that in a discontinuous PVD seed layer 11:15:15  
 6 the barrier is peeking through the discontinuities, 11:15:19  
 7 so it's sort of like plating on barrier, except with 11:15:22  
 8 the eyelets already there? 11:15:25  
 9 MR. RIEDINGER: Objection, foundation. 11:15:27  
 10 THE WITNESS: The idea wasn't the fact 11:15:28  
 11 that the exposed barrier was in some way a good 11:15:34  
 12 situation, it was that that barrier could 11:15:36  
 13 potentially be covered by copper deposited 11:15:38  
 14 laterally, if you will, from the discontinuous 11:15:42  
 15 eyelets. So, the idea was that if you could in fact 11:15:45  
 16 deposit a very conformal copper film, a very thin 11:15:50  
 17 copper film, and cover up or bridge the 11:15:56  
 18 discontinuities, that you could achieve what you 11:16:00  
 19 needed for the subsequent high-rate full-thickness 11:16:03  
 20 Damascene bottom-up super-fill copper. 11:16:07  
 21 BY MR. MELNIK: (continuing) 11:16:11  
 22 Q. No, I didn't mean to suggest that the 11:16:16  
 23 barrier peeking through was a good thing. I guess 11:16:18  
 24 what I was asking rather was that whether the 11:16:20  
 25 presence of the barrier peeking through the 11:16:22

51

1 to or as contrasted with the patent applications on 11:17:57  
 2 which members of the ATG group who worked in my 11:18:00  
 3 organization were the named inventors on. I don't 11:18:04  
 4 remember. 11:18:06  
 5 Q. Do you remember if you discussed with 11:18:09  
 6 Mr. Burkhardt any seed layer repair patent 11:18:13  
 7 applications? 11:18:17  
 8 A. I don't. 11:18:17  
 9 MR. RIEDINGER: Mr. Taylor, I'm going to 11:18:18  
 10 object to your answering the question. Semitool has 11:18:21  
 11 not waived the privilege, so we would object to 11:18:23  
 12 discussions of the substance of the communication. 11:18:26  
 13 THE WITNESS: Understood. 11:18:28  
 14 I don't recall whether discussions with 11:18:29  
 15 Pat Burkhardt involved seed layer repair 11:18:31  
 16 applications or disclosures or whatever. 11:18:34  
 17 BY MR. MELNIK: (continuing) 11:18:36  
 18 Q. Do you remember the circumstances under 11:18:38  
 19 which Mr. Burkhardt left? 11:18:39  
 20 A. Not specifically, no. 11:18:44  
 21 Q. Do you remember anything about the 11:18:55  
 22 circumstances under which he left? 11:18:57  
 23 A. I remember only the fact that he was 11:18:58  
 24 displeased, so I do not believe it was voluntary. 11:19:04  
 25 Q. Do you know what he was displeased about? 11:19:06

53

<p>1 impossible to generalize. What you observe in the 10:52:48  2 early state of nucleation will be highly dependent 10:52:51  3 on whether the barrier you're using is of one 10:52:55  4 composition or another, was deposited in one way or 10:53:01  5 another, is oxidized to certain degrees. So it's 10:53:03  6 difficult -- or impossible to generalize. 10:53:07  7 BY MR. MELNIK: (continuing) 10:53:09  8 Q. Then let me ask it this way. When you 10:53:09  9 said that the seed layer repair work grew out of the 10:53:11  10 direct on-barrier work, what was the conceptual 10:53:14  11 relationship that caused one to grow out of the 10:53:19  12 other? 10:53:21  13 A. The conceptual relationship was a 10:53:21  14 discovery of these tremendous sensitivities to the 10:53:23  15 surface state of the barrier itself, and the 10:53:29  16 observation that direct on-barrier plating on the 10:53:32  17 barrier that was emerging as the preferred 10:53:35  18 formulation in the industry was difficult or 10:53:38  19 impossible to achieve with our current state of 10:53:44  20 understanding, though we observed as a consequence 10:53:47  21 of that work that if there was, in fact, a thin, 10:53:49  22 preexisting copper layer, that we could achieve a 10:53:52  23 successful deposition. 10:53:56  24 Q. And which barrier material was this? 10:53:58  25 A. The barrier material that was emerging as 10:54:00</p>	<p>1 A. That is my recollection, is that on 10:55:39  2 titanium nitride it was much easier to initiate 10:55:42  3 direct on-barrier plating, and it typically 10:55:47  4 proceeded from the initial nucleation of eyelets 10:55:49  5 that would subsequently merge. 10:55:52  6 Q. And those kinds of eyelets are sort of 10:55:54  7 similar to a discontinuous PVD seed? Is that the 10:55:58  8 conceptual connection? 10:56:03  9 MR. RIEDINGER: Objection, leading. 10:56:03  10 THE WITNESS: The conceptual connection. 10:56:04  11 BY MR. MELNIK: (continuing) 10:56:07  12 Q. I'm sorry. You said yes, that's the 10:56:08  13 conceptual connection? 10:56:10  14 A. No, no, no, I didn't. I'm sorry. 10:56:10  15 connection to what? 10:56:12  16 Q. Between direct on-barrier plating -- 10:56:13  17 excuse me -- and seed repair. 10:56:16  18 A. No. The connection was the observation 10:56:21  19 that seed repair could in fact bridge or could -- 10:56:24  20 had the potential to bridge eyelets of discontinuous 10:56:31  21 copper deposited by conventional PVD, but was 10:56:36  22 incapable of depositing a continuous film directly 10:56:40  23 on something like a tantalum nitride. 10:56:44  24 What you say is logically connected, but 10:56:47  25 what we -- I'm not saying that we necessarily made 10:56:49</p>
<p>1 the preferred barrier for Damascene applications was 10:54:04  2 a tantalum nitride. 10:54:08  3 Q. And on tantalum nitride, assuming it's 10:54:18  4 properly cleaned, if one is doing direct on-barrier 10:54:21  5 electrolytic deposition, let's say, from an alkaline 10:54:27  6 bath, is there a time point where the -- early on in 10:54:30  7 the deposition where the copper material has sort of 10:54:39  8 nucleated into eyelets of copper with naked barrier 10:54:43  9 in between? Is that how this is generally 10:54:48  10 conceptualized? 10:54:51  11 MR. RIEDINGER: Hypothetical. 10:54:52  12 THE WITNESS: At the time that I was 10:54:54  13 involved directly, with the foreknowledge that 10:54:55  14 things may have changed in the course of the last 10:55:00  15 two years, at the time our conclusion was that 10:55:02  16 tantalum nitride itself was nearly electrochemically 10:55:06  17 inert, and achieving any form of adherent deposition 10:55:11  18 with copper, whether as isolated eyelets or as 10:55:15  19 continuous film, was extremely difficult. We 10:55:19  20 observed on alternative barrier films was a 10:55:22  21 phenomenon much as you described, but not 10:55:29  22 necessarily on tantalum nitride. 10:55:31  23 BY MR. MELNIK: (continuing) 10:55:32  24 Q. So let's say on CVD Ti nitride barriers, 10:55:34  25 one would see this kind of process? 10:55:37</p>	<p>1 that explicit logical sequential connection, saying 10:56:53  2 that if eyelets form on titanium nitride and can 10:56:58  3 subsequently be bridged successfully with an 10:57:03  4 alkaline electrolytic bath, therefore we should be 10:57:06  5 able to do seed repair. It was a question of 10:57:08  6 observing that a continuous film could be formed on 10:57:10  7 a discontinuous PVD seed, but no continuous 10:57:14  8 deposition could be achieved on tantalum, tantalum 10:57:21  9 nitride. An attempt to do it on tantalum, direct 10:57:24  10 on-barrier plating electrolytically on tantalum 10:57:27  11 tantalum nitride wasn't successful, but an ability 10:57:28  12 to use a discontinuous thin seed -- or a preexisting 10:57:33  13 PVD seed was. 10:57:37  14 MR. MELNIK: Why don't we take a short 10:57:46  15 break. 10:57:48  16 THE WITNESS: I would appreciate it. 10:57:48  17 (A recess is then taken.) 10:57:50  18 THE VIDEOGRAPHER: Back on the record. 11:12:53  19 The time is 11:12 a.m. 11:12:55  20 BY MR. MELNIK: (continuing) 11:12:57  21 Q. Okay. So before the break we were 11:12:58  22 discussing the direct on-barrier plating 11:13:00  23 experiments, and I have another question because I 11:13:06  24 was puzzling about your answers over the break. 11:13:09  25 So you do these direct on-barrier plating 11:13:11</p>

<p>1 Cross and Bob Pollett were the only two that would 11:25:29</p> <p>2 have been participants in that discussion. I don't 11:25:33</p> <p>3 recall talking with any of the other attorneys on 11:25:37</p> <p>4 this topic. 11:25:48</p> <p>5 Q. And with respect to the technical team 11:25:49</p> <p>6 discussions, do you recall who else might have 11:25:51</p> <p>7 participated in these conversations? 11:25:54</p> <p>8 A. Well, who else might have participated? 11:25:56</p> <p>9 My read of this Exhibit 1002 is that those -- that 11:26:01</p> <p>10 is a list of the individuals who would have had 11:26:08</p> <p>11 knowledge of either the content of the '181 patent 11:26:11</p> <p>12 or any other related technologies. 11:26:14</p> <p>13 Q. And you were referring to Semitool's 11:26:17</p> <p>14 interrogatory response? 11:26:19</p> <p>15 A. Interrogatory response, if that was the 11:26:20</p> <p>16 right number. 11:26:22</p> <p>17 MR. MELNIK: Subject to redirect, I don't 11:26:23</p> <p>18 have any further questions. 11:26:40</p> <p>19 MR. BOBROW: On behalf of Applied 11:26:44</p> <p>20 Materials, I have no questions, subject to redirect 11:26:46</p> <p>21 on questions by either Ebara or by Semitool. 11:26:48</p> <p>22 MR. KEARNEY: I have no questions, subject 11:26:52</p> <p>23 to reservation of redirect. 11:26:55</p> <p>24 MR. RIEDINGER: Can we take a quick break 11:26:57</p> <p>25 so I can consult with co-counsel. 11:26:59</p> <p>58</p>	<p>1 are my ongoing obligations from this point? 11:31:38</p> <p>2 MR. MELNIK: Don't destroy documents. 11:31:41</p> <p>3 THE WITNESS: Okay. Very good. Is it 11:31:44</p> <p>4 common practice to be recalled for further 11:31:46</p> <p>5 questions? 11:31:48</p> <p>6 MR. MELNIK: No. 11:31:48</p> <p>7 THE WITNESS: Fine. 11:31:50</p> <p>8 MR. RIEDINGER: The trial is scheduled in 11:31:52</p> <p>9 more than a year from now, in the summer of 2003, 11:31:55</p> <p>10 and I don't think any of the parties have decided 11:31:59</p> <p>11 yet who they want to have as trial witnesses, so if 11:32:01</p> <p>12 you're wondering if you're going to be called as a 11:32:03</p> <p>13 witness at trial, I don't think anybody knows yet. 11:32:06</p> <p>14 THE WITNESS: Understood. 11:32:08</p> <p>15 MR. RIEDINGER: Thank you. 11:32:12</p> <p>16 THE VIDEOGRAPHER: Off the record. 11:32:13</p> <p>17 (Deposition concluded at 11:32 a.m.)</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p> <p>23</p> <p>24</p> <p>25</p> <p>60</p>
<p>1 THE VIDEOGRAPHER: Off the record. 11:27:03</p> <p>2 (A recess is then taken.) 11:27:05</p> <p>3 THE VIDEOGRAPHER: On the record. 11:30:39</p> <p>4 MR. RIEDINGER: We have no questions. 11:30:48</p> <p>5 Thank you very much, Mr. Taylor. 11:30:50</p> <p>6 THE WITNESS: My pleasure. 11:30:51</p> <p>7 MR. MELNIK: And Mr. Taylor, as I was 11:30:52</p> <p>8 explaining during the break, but I'll just repeat 11:30:54</p> <p>9 it, at some point the court reporter will send you a 11:30:57</p> <p>10 copy of the transcript. You should read over it, 11:31:00</p> <p>11 and if anything got mistranscribed or if there is -- 11:31:04</p> <p>12 if there are any answers that you want to 11:31:07</p> <p>13 supplement, you're welcome to do so, just type up 11:31:09</p> <p>14 your supplemental answer or hand write it or 11:31:13</p> <p>15 whatever you like, call one of us, we'll send a 11:31:16</p> <p>16 notary over to notarize it for you, and that will be 11:31:19</p> <p>17 your supplemental testimony. So please feel free to 11:31:22</p> <p>18 do that if there's something you need to add. 11:31:24</p> <p>19 THE WITNESS: And one more time, to whom 11:31:26</p> <p>20 should that be submitted? 11:31:28</p> <p>21 MR. RIEDINGER: To the court reporter. 11:31:31</p> <p>22 THE WITNESS: To the court reporter. 11:31:31</p> <p>23 MR. MELNIK: So you should grab one of her 11:31:32</p> <p>24 cards. 11:31:35</p> <p>25 THE WITNESS: Very good, very good. What 11:31:37</p> <p>59</p>	<p>1 CERTIFICATE</p> <p>2</p> <p>3 I, Bonita J. Alexander, Certified</p> <p>4 Shorthand Reporter for Oregon, Registered Merit</p> <p>5 Reporter and Registered Professional Reporter, do</p> <p>6 hereby certify that THOMAS TAYLOR personally</p> <p>7 appeared before me at the time and place set forth</p> <p>8 herein; that at said time and place I reported in</p> <p>9 stenotype all testimony adduced and other oral</p> <p>10 proceedings had in the foregoing matter; that</p> <p>11 thereafter my notes were transcribed using</p> <p>12 computer-aided transcription under my direction; and</p> <p>13 the foregoing transcript, pages 1 to 60, both</p> <p>14 inclusive, constitutes a full, true and accurate</p> <p>15 record of such testimony adduced and oral</p> <p>16 proceedings had and of the whole thereof.</p> <p>17 Witness my hand and stamp at Portland,</p> <p>18 Oregon, this 29th day of March, 2002.</p> <p>19</p> <p>20</p> <p>21</p> <p>22 Bonita J. Alexander, RMR, RPR,</p> <p>23 CRR, Oregon Certified Shorthand</p> <p>24 Reporter No. 95-0315</p> <p>25</p> <p>61</p>

1 A. I believe he was displeased at losing his 11:19:11  
2 employment. That's my recollection. 11:19:15  
3 Q. Do you remember if there was anything 11:19:20  
4 about which he was displeased prior to his losing 11:19:24  
5 his employment? 11:19:27  
6 A. No, I don't remember that there was 11:19:28  
7 anything specifically that he was displeased about. 11:19:35  
8 As I noted a moment ago, it took me a while to even 11:19:38  
9 remember who the person was, much less the many 11:19:42  
10 details about, you know, his work. 11:19:44  
11 My recollection, as we're discussing it, 11:19:52  
12 is that there were -- it was extremely difficult at 11:19:54  
13 times to track him down, to get his attention. I 11:19:57  
14 think that may have had something to do with his 11:20:01  
15 subsequent departure from the company. 11:20:04  
16 Q. Do you know who Bob Pollett is? 11:20:07  
17 A. Bob Pollett, yes. As a matter of fact, 11:20:10  
18 he, from what I recall, at least, he is an attorney 11:20:13  
19 at a firm that's retained by Semitool, patent 11:20:17  
20 attorney. 11:20:24  
21 Q. Did you ever have any meetings or 11:20:24  
22 discussions with Mr. Pollett relating to any patent 11:20:26  
23 applications? 11:20:29  
24 A. Oh, yes. That's why I recall. That's why 11:20:30  
25 I remember him. 11:20:32

54

1 difficult for me to say that a given topic was 11:22:00  
2 necessarily discussed. I almost have to remember 11:22:05  
3 details of a given conversation, and the fact is 11:22:08  
4 that I don't. I know that we had an intensive 11:22:11  
5 effort to discuss any and all of the potentially 11:22:15  
6 protectable development work that was taking place, 11:22:24  
7 but I do not recall a specific conversation or the 11:22:30  
8 content of any conversation with Pete Cross -- Harry 11:22:34  
9 Cross -- on the issue of seed repair. 11:22:38  
10 Q. I certainly understand that the reason why 11:22:41  
11 lawyers ask these questions is sometimes in the 11:22:45  
12 middle of the answer, the witness -- a light bulb 11:22:48  
13 will go on and the witness will say, "Oh, now I 11:22:52  
14 remember." That's why we ask. 11:22:56  
15 A. Yes. 11:22:59  
16 Q. And thinking back to the Leti and IMEC 11:22:59  
17 papers on seed repair that we were chatting about 11:23:03  
18 earlier, do you remember if you ever provided a copy 11:23:05  
19 of those to Pete Cross? 11:23:07  
20 A. No. In fact -- please excuse me, but I 11:23:09  
21 want to -- during the break it was my recollection, 11:23:13  
22 my recall of the work done at IMEC is significantly 11:23:19  
23 clearer than a recall of a specific document or 11:23:23  
24 paper from Leti. That one is vaguer. But I do -- 11:23:27  
25 and I gave you, of course, Dr. Roger Palmans' name, 11:23:31

56

1 Q. Do you remember if you ever participated 11:20:34  
2 in any meetings with Mr. Pollett relating to any 11:20:38  
3 Semitool applications relating to seed repair? 11:20:41  
4 A. I do not recall any specific 11:20:43  
5 conversations. It -- I do not recall specific 11:20:45  
6 conversations about seed repair with Bob Pollett. 11:20:48  
7 By the same token, I don't recall whether that 11:20:52  
8 was -- let me put this -- I don't recall one way or 11:20:58  
9 the other. 11:21:01  
10 Q. Do you know if you ever shared with Bob 11:21:06  
11 Pollett copies of either or any of the IMEC papers 11:21:09  
12 or the Leti papers on seed repair that we were 11:21:14  
13 chatting about earlier? 11:21:17  
14 A. I don't recall bringing them to his 11:21:25  
15 attention. 11:21:27  
16 Q. Obviously you know Mr. Cross. 11:21:31  
17 A. Yes. 11:21:33  
18 Q. Do you recall having any meetings with 11:21:34  
19 Mr. Cross to discuss Semitool patent applications? 11:21:37  
20 A. Yes. 11:21:44  
21 Q. Do you recall if any of those meetings 11:21:46  
22 related to seed repair patent applications? 11:21:49  
23 A. Excuse me just a moment. I'm going to 11:21:51  
24 have to tell you something, though. Absent the 11:21:55  
25 ability to remember a specific meeting, it's 11:21:57

55

1 but the IMEC paper is the one that's clearest in my 11:23:34  
2 mind. I do not recall giving a copy of that 11:23:37  
3 specifically to Pete Cross. 11:23:40  
4 Q. Okay. 11:23:48  
5 A. Harry Cross. I want to make sure we're 11:23:49  
6 talking about the same person. 11:23:50  
7 Q. I think pretty much everyone has called 11:23:51  
8 Mr. Cross Pete Cross in this case, including the 11:23:54  
9 judge. So I think we're okay. 11:23:56  
10 Do you recall if there were -- Let me back 11:24:12  
11 up. Do you recall any of the meetings with the 11:24:19  
12 lawyers that dealt with the subject of seed repair 11:24:25  
13 patent applications? 11:24:33  
14 A. I remember the discussions with the 11:24:34  
15 technical team with greater clarity than I do 11:24:43  
16 discussions with the lawyers. I do not recall 11:24:49  
17 specific discussions with any of the lawyers, either 11:24:52  
18 employed by Semitool or retained by them on this 11:24:56  
19 topic. 11:25:00  
20 Q. As opposed to specific discussions, do you 11:25:04  
21 perhaps remember which lawyers other than Mr. Cross 11:25:07  
22 and Mr. Pollett might have participated in 11:25:11  
23 discussions related to seed layer repair patent 11:25:14  
24 applications? 11:25:17  
25 A. To the best of my recollection, Harry 11:25:17

57

15

<p>connected 48:24  connection 48:8,10,13  48:15,18 49:1 51:4  consequence 16:9  46:20  consequently 38:16  42:4  considered 33:25  consistent 29:22  constitute 33:22  constitutes 61:14  constraint 32:1  consult 58:25  consultant 28:21 29:1  consultants 20:7  contacted 7:6  CONTAINS 1:18  contemporaneous  31:15  content 56:8 58:11  contents 34:15  context 9:5,6 39:3 44:5  52:11  continue 43:16  continuing 16:22 19:3  20:14 21:2 24:17  25:14,20 27:8,22  30:21 31:6 34:2 35:6  39:12,23 40:10 41:4  42:6 44:8 45:8 46:7  47:23 48:11 49:20  51:21 53:17  continuous 47:19 48:22  49:6,7  continuously 21:25  contracted 5:9  contractual 12:15  contrasted 53:1  conventional 42:12,14  48:21  conversation 56:3,7,8  conversations 55:5,6  58:7  copied 30:14 34:17  copies 23:12,24 34:11  55:11  copper 14:16 15:6,24  21:11 26:3,7,9,15,17  37:6 45:19 46:22  47:7,8,18 48:21 51:13  51:16,17,20  copy 27:3 28:11 40:7  56:18 57:2 59:10  copying 30:25  corner 27:2  corporate 6:2  corporation 1:12 2:25  5:23 10:10  correct 8:21 24:21  32:23  correctly 26:18  counsel 3:9 5:16 6:2,23  course 12:9,22 34:5  36:18 47:14 56:25  court 1:1 6:3,5 8:12  18:5 27:6 59:9,21,22</p>	<p>cover 51:17 52:5  covered 50:11 51:13  co-counsel 58:25  co-inventor 43:5  Cray 7:25 10:7  criteria 26:17  cross 3:8 6:2 18:20,25  19:17,22 55:16,19  56:8,9,19 57:3,5,8,8  57:21 58:1  cross-section 22:2  CRR 61:23  cup 50:17  current 46:19  currently 8:3  customer 14:22 17:22  18:15 39:3  customers 16:21 17:8  customer's 17:8  cut 36:20  CVD 22:4 26:10 47:24</p> <hr/> <p style="text-align: center;"><b>D</b></p> <hr/> <p>D 4:1 12:11  Damascene 37:8 47:1  51:20  databases 37:15,18,21  37:22  date 5:7 14:4,4 44:16  dates 15:15 43:25  day 2:6 61:18  deal 26:14  dealt 57:12  decided 60:10  default 32:13,16  Defendant 1:7,20,23  2:3,19,24 3:4 6:9  Defendants 1:14  degree 10:1  degrees 46:5  delta 14:10,11  demo 16:1  demonstrate 17:7 21:8  41:25 42:1  demonstrating 14:14  demonstrations 26:24  39:4  demos 16:2 17:9,22  departed 12:8 23:22  departure 54:15  depend 19:13  dependent 46:2  deposit 25:12,15,22  26:1,3 51:16  deposited 46:4 48:21  51:13  depositing 25:11 26:5  45:16 48:22  deposition 1:22 2:2 4:2  5:2,12 6:21,25 7:5,7  8:8 13:1 21:11,11  26:7 41:14 42:14  45:10 46:23 47:5,7,17  49:8 50:8,12 51:3  60:17  deposits 26:9</p>	<p>derivative 14:20  describe 12:3 43:24  described 11:25 25:2  38:2,11 39:4 41:12,22  42:25 45:1,24 47:21  50:21  describing 38:13  design 14:21 15:12  28:6,9 30:4,19 31:13  designate 17:25 18:12  18:17 19:25  designing 29:4  despite 25:9  destroy 60:2  detail 12:3 41:13,23  43:13  details 12:19 16:18,20  23:4 54:10 56:3  develop 14:14  developed 16:8  developing 10:19 12:14  development 10:5 12:6  13:13,15,20 17:2 29:2  30:15 31:3,5 33:16,24  35:22 36:1,2 42:3  56:6  devices 15:24  dialogue 16:9  different 41:13 43:6  difficult 46:6,18 47:19  54:12 56:1  dig 33:13  direct 30:19 45:10  46:10,16 47:4 48:3,16  49:9,22,25 50:5,15  52:3,7  direction 61:12  directly 45:16 47:13  48:22  director 12:7,10 14:1  14:13  discipline 8:4  disclosures 53:16  discontinuities 51:6,18  52:1  discontinuous 21:25  22:5 25:16 48:7,20  49:7,12 51:5,14  discoveries 35:19,20  discovery 18:10 46:14  discuss 17:20 34:19  55:19 56:5  discussed 34:15 35:15  35:19 53:5 56:2  discussing 27:16,25  34:10 35:10 40:20  49:22 54:11  discussion 35:12 58:2  discussions 28:14,17,18  31:12 33:23 43:13,14  44:3,6,20 45:5 52:17  52:19 53:12,14 54:22  57:14,16,17,20,23  58:6  displeased 53:24,25  54:1,4,7</p>	<p>disseminatable 32:15  disseminate 31:22 32:4  33:11  disseminated 32:11  33:2 34:14  distinguishing 37:13  DISTRICT 1:1,2  division 14:2  Dixie 50:17  document 27:4,10,21  32:18 56:23  documentation 24:1  33:23  documents 33:13 36:20  36:21 60:2  doing 8:15 16:1 22:13  26:6,24 44:12 47:4  domain 22:17 37:23  domestic 16:21  done 16:21,25 17:6  29:17 32:2,10 42:24  56:22  down 8:12 54:13  dozen 37:10  Dr 24:13,18 30:3,10  34:7 40:22 41:16  42:7,9,11,25 44:6,7  44:12,21 45:1 56:25  DRAM 10:19  drastically 15:20  drawbacks 25:8  duly 6:10  during 11:9 23:2 28:25  34:3 37:23 41:25  43:7 44:9 45:15  52:16 56:21 59:8</p> <hr/> <p style="text-align: center;"><b>E</b></p> <hr/> <p>E 4:1  each 9:4  Eagan 10:4  earlier 14:20 15:7  42:24 55:13 56:18  early 11:12 13:8 14:16  14:17 42:1 45:17  46:2 47:6  easier 48:2  easily 37:10  ebar 1:12,12 2:24 5:6  5:23 58:21  ECD 14:2  ECDC 45:4,9  educational 7:18  effectively 7:14  efficacy 21:9  effort 56:5  either 26:3 35:4 37:14  55:11 57:17 58:11,21  electrically 22:1  electro 41:14  electrochemically  47:16  electrochemist 30:13  electroless 12:25 13:6  21:10,16,18 22:8,12  22:13,14 23:4 25:2,3</p>	<p>25:7 26:4,5,9 27:24  28:2 30:12 37:6 38:4  38:7,19 40:21 42:8,9  42:12,14,22,22  electroless-like 4:4  electrolytic 42:18 45:16  47:5 49:4  electrolytically 49:10  electroplate 15:24  electroplating 12:25  13:6,15 14:15 15:5,8  15:10,12 21:9,21  50:12 51:2  eliminated 50:19  eliminating 50:23  elimination 50:6  embodiment 41:22,24  42:16 45:1  emerging 46:17,25  employ 17:4  employed 7:10,25 23:3  25:11 42:13 57:18  employee 16:10,11  19:12,17 28:24  employment 9:13  10:13,13 54:2,5  employs 17:2  Encino 5:11  end 11:23  engaged 31:13  engineer 10:5 29:13,23  engineering 7:22,23  9:21  engineers 13:15  enhancement 21:16  26:11 27:24 28:2  enhancements 15:22  enjoyed 14:18  enough 19:24 28:3  entire 22:1 52:7  entirely 36:22  equipment 29:15  equivalent 42:1  especially 28:25  essentially 20:19 45:19  estate 43:14  et 39:11 45:7  etching 13:18  European 23:18  evaluated 25:25  evaluating 21:15,18  22:18  even 17:20 54:8  ever 8:9 37:24,25 38:3  38:6 54:21 55:1,10  56:18  every 35:23  everyone 57:7  exact 9:9  exactly 11:4,9,11,21  22:21 34:13  examination 4:3 6:13  examined 6:11  example 17:4 38:23  39:3  except 51:7</p>
---	--	--	--	--

<p><b>A</b></p> <p>ability 22:10 25:22 26:1 49:11 55:25</p> <p>able 37:4 49:5</p> <p>about 7:7,14,17 8:7 14:6 15:23 19:5,10 29:7 34:19 42:17 43:22 49:24 53:21,25 54:4,7,10 55:6,13 56:17 57:6</p> <p>absent 26:4,6 55:24</p> <p>absolutely 21:13 37:1</p> <p>access 20:10</p> <p>accurate 61:14</p> <p>achieve 46:19,22 51:18</p> <p>achieved 49:8</p> <p>achieving 47:17</p> <p>acid 13:17</p> <p>acknowledgment 50:18</p> <p>acquired 10:6</p> <p>across 24:12 35:23</p> <p>acting 28:20</p> <p>activities 13:14 22:16 30:15 31:2,5 33:24</p> <p>actual 24:8</p> <p>actually 29:19 39:20 45:3</p> <p>add 12:13 59:18</p> <p>additional 40:6</p> <p>address 6:16,18</p> <p>adduced 61:9,15</p> <p>adherent 47:17</p> <p>advanced 34:5,6,12</p> <p>advise 43:17</p> <p>after 12:6 13:25 21:5 37:14 40:11 41:6</p> <p>again 28:25 29:21 37:12</p> <p>ago 7:15 42:17 54:8</p> <p>agree 19:17</p> <p>agreed 20:8</p> <p>agreement 18:12 33:17</p> <p>ahead 9:24 10:17 34:24</p> <p>al 45:7</p> <p>Alexander 2:5 6:4 61:3 61:22</p> <p>alkaline 42:18 45:15 47:5 49:4</p> <p>alliances 12:7,10</p> <p>allow 20:7</p> <p>almost 56:2</p> <p>alone 21:22</p> <p>Along 24:1</p> <p>already 12:1 18:24 30:9 51:8</p> <p>alternative 47:20</p> <p>although 17:25 28:21</p> <p>altogether 50:24 51:1</p> <p>ambiguous 23:7</p> <p>ameliorated 50:20</p> <p>among 41:11</p> <p>amount 12:22</p> <p>Angeles 5:10</p> <p>another 33:22 37:8 46:4,5 49:23</p> <p>answer 9:2,10 13:3,4,4</p>	<p>18:10 20:15 21:5 25:21 29:18 33:15 35:3,7 39:8 40:4 41:6 43:17 56:12 59:14</p> <p>answering 53:10</p> <p>answers 8:18 49:24 59:12</p> <p>anticipated 42:2</p> <p>anybody 60:13</p> <p>Anybody's 18:8</p> <p>anyone 36:14,16</p> <p>anything 18:14 23:14 29:8 53:21 54:3,7 59:11</p> <p>Apartment 6:18</p> <p>apologies 39:21</p> <p>apologize 26:20 35:2</p> <p>APPEARANCES 2:11</p> <p>appeared 25:10 61:7</p> <p>appearing 2:14,18,24 3:3</p> <p>applicability 44:4</p> <p>applicable 41:21</p> <p>application 15:11 38:13 39:6</p> <p>applications 14:22 15:8 15:11 37:7 38:1,7,10 39:7 41:13 43:23 47:1 52:20,23,25 53:1 53:7,16 54:23 55:3,19 55:22 57:13,24</p> <p>applied 1:6 2:19 5:4,21 20:4 40:1 58:19</p> <p>appreciate 30:9 49:16</p> <p>appreciated 7:13</p> <p>approach 14:15 29:11 29:22 33:25</p> <p>approaches 38:15,19</p> <p>appropriate 43:19</p> <p>approximately 11:16 12:6 13:21,22,25 14:11</p> <p>April 11:24</p> <p>architecture 14:19,25</p> <p>arrangements 12:15</p> <p>arrived 13:25</p> <p>art 35:20 36:6 41:16</p> <p>aside 22:9</p> <p>asked 9:10 22:23 23:8</p> <p>asking 51:24</p> <p>assume 41:2</p> <p>assumes 40:25</p> <p>assuming 47:3</p> <p>ATG 34:3 53:2</p> <p>attempt 23:5 49:9</p> <p>attempting 52:5</p> <p>attention 54:13 55:15</p> <p>attorney 54:18,20</p> <p>attorneys 7:9 43:21 58:3</p> <p>attorney-client 43:18</p> <p>authors 22:19,21,22,24 24:3</p> <p>autumn 11:7,8,9,12</p> <p>availability 29:15</p> <p>available 17:5 37:19</p>	<p>41:12</p> <p>Avenue 2:7</p> <p>avoid 51:1</p> <p>away 10:4</p> <p>a.m 2:9 5:8 49:19 60:17</p> <p><b>B</b></p> <p>baccalaureate 7:21</p> <p>bachelor 7:22</p> <p>back 28:4,22 33:10 36:4 37:3,24 45:14 49:18 56:16 57:10</p> <p>background 7:18 8:11 30:17</p> <p>barrier 25:17,23 45:17 45:20,25 46:3,15,17 46:24,25 47:1,8,20 50:7,24 51:6,7,11,12 51:23,25 52:5</p> <p>barriers 47:24</p> <p>based 14:4 37:22</p> <p>baseline 12:20</p> <p>basically 17:15 24:23</p> <p>basis 42:23 43:2</p> <p>bath 47:6 49:4</p> <p>before 2:4 9:10 26:19 37:14 39:21 49:21 61:7</p> <p>beginning 7:18 11:23</p> <p>behalf 1:23 2:2,14,19 2:24 3:4 6:9 58:19</p> <p>behind 36:17</p> <p>being 6:10,20 9:7,10 15:8 16:13 21:21 31:25 32:15</p> <p>Belgian 24:23</p> <p>believe 17:19 23:18 24:15 28:21,23 38:3 43:19 52:12 53:24 54:1</p> <p>benefit 6:22 30:16</p> <p>Beovich 6:4</p> <p>Berner 28:13</p> <p>best 23:20,22 24:3,6 35:22 41:24 42:19 57:25</p> <p>better 50:2</p> <p>between 12:15 47:9 48:16 51:4 52:2</p> <p>binder 36:6</p> <p>binding 34:1</p> <p>bit 8:10 11:25</p> <p>board 28:23 30:10,16 35:23</p> <p>Bob 28:13 54:16,17 55:6,10 58:1</p> <p>bobrow 2:18 5:20,20 20:3 35:3 39:17 58:19</p> <p>Bonita 2:4 6:4 61:3,22</p> <p>both 9:20 13:15 22:18 24:16 25:1,18,21 52:18 61:13</p> <p>bottom-up 51:20</p> <p>Boulevard 5:10</p> <p>break 49:15,21,24</p>	<p>56:21 58:24 59:8</p> <p>bridge 19:22 48:19,20 51:17</p> <p>bridged 49:3</p> <p>bring 6:25</p> <p>bringing 55:14</p> <p>broad 15:8 42:5</p> <p>broader 45:3</p> <p>broadly 41:21</p> <p>brought 11:7 28:23</p> <p>build 14:16</p> <p>bulb 56:12</p> <p>bulk 21:11 44:12</p> <p>bunch 45:19</p> <p>Burkhardt 52:9,10,14 53:6,15,19</p> <p>Burroughs 10:6</p> <p><b>C</b></p> <p>cabinets 36:9</p> <p>California 5:11</p> <p>call 59:15</p> <p>called 6:9 8:4 9:17 10:2 10:10,20 16:2 26:11 32:7 57:7 60:12</p> <p>calls 40:24 44:23</p> <p>came 16:9,23 17:1</p> <p>cards 59:24</p> <p>carefully 9:1 12:2</p> <p>case 5:4 18:16 27:1 43:19 57:8</p> <p>cases 26:1 33:16,18 34:1 42:21 52:6</p> <p>cast 42:4</p> <p>catch 8:21</p> <p>caused 46:11</p> <p>cc 30:1</p> <p>cc'ing 30:22</p> <p>certain 12:22 20:7 46:5 46:10</p> <p>certainly 7:20 37:6 56:10</p> <p>CERTIFICATE 61:1</p> <p>Certified 2:5 61:3,23</p> <p>certify 61:6</p> <p>cetera 39:11</p> <p>challenges 25:10</p> <p>change 13:23 15:20</p> <p>changed 14:5 47:14</p> <p>characterize 27:21</p> <p>characterized 21:15</p> <p>Charles 6:17</p> <p>chatting 55:13 56:17</p> <p>chemical 7:22,23 13:16</p> <p>chemistries 42:11,13 42:21 44:4</p> <p>chemistry 35:24 36:1</p> <p>Chen 28:12 30:1,10 34:7 39:13 41:16 42:7,9,11 44:6,7,12 44:21,21 45:1</p> <p>Chen's 30:3 40:22 42:25</p> <p>Chin 30:1</p> <p>Chippewa 10:7</p> <p>chose 7:14,25</p> <p>Chun 28:15,16 31:8</p>	<p>circle 24:2</p> <p>circumstances 32:12 52:16 53:18,22</p> <p>CITR 33:20,25</p> <p>City 9:20</p> <p>Civil 2:4</p> <p>claims 38:16 41:20 42:4</p> <p>clarity 57:15</p> <p>cleaned 47:4</p> <p>cleaning 13:17,17</p> <p>clear 38:14</p> <p>clearer 56:23</p> <p>clearest 57:1</p> <p>clearly 16:20</p> <p>clients 18:4</p> <p>close 24:2</p> <p>CMOS 12:20</p> <p>coated 50:11</p> <p>coie 2:7,12 5:13,25 6:1 7:6,8</p> <p>collaboratively 32:3</p> <p>collateral 14:14</p> <p>college 7:18</p> <p>Colorado 10:23 12:9</p> <p>come 16:6 17:8 19:23 23:5</p> <p>commencing 2:8</p> <p>comments 25:8</p> <p>commitment 7:14</p> <p>common 60:4</p> <p>communicated 31:23</p> <p>communication 53:12</p> <p>communications 43:20 43:22,24</p> <p>company 7:9 10:9,20 11:2 54:15</p> <p>compatibility 17:7</p> <p>completing 8:1</p> <p>comply 20:9</p> <p>composition 46:4</p> <p>Compound 25:19 30:7</p> <p>computer 36:25 37:1</p> <p>computer-aided 61:12</p> <p>conceivable 24:14</p> <p>concentrated 25:7</p> <p>concept 44:21 45:2,3</p> <p>conception 40:17</p> <p>conceptual 46:10,13 48:8,10,13 52:1</p> <p>conceptualized 47:10</p> <p>conceptualizing 29:11</p> <p>concerned 19:10</p> <p>concluded 60:17</p> <p>conclusion 10:22 43:11 47:15</p> <p>condition 50:14</p> <p>conducted 29:23</p> <p>conductive 22:1</p> <p>conference 23:9,19</p> <p>confidential 1:19 18:1 18:2,6,8,13,18,21 19:9,19 20:1 32:19 33:1,20</p> <p>configuration 29:16</p> <p>conformal 51:16</p>
--	--	--	---	---

40:2,3,14 42:17 55:23 59:8,13 J-i-c-k 31:17 J.P 2:23	less 54:9 let 8:7 17:23 26:25 28:4 36:4 37:24 39:19,24 44:15 45:14 46:8 55:8 57:10 Leti 16:14,16 22:4,7,11 24:4,7,8,16 26:14 34:10 38:24 55:12 56:16,24 let's 19:22 20:15 45:15 47:5,24 liberty 17:19 light 56:12 like 7:2 8:20 32:19 36:7 42:24 43:17 48:23 51:7 59:15 Limelight 3:12 line 30:1 40:11 Linlin 28:12 30:1 44:21 list 28:11 58:10 listed 18:9 31:8 listen 9:1,5,9 listening 12:2 literature 23:2 34:9 35:16 36:7,24 37:11 38:25 41:14 litigation 20:8 little 8:10 11:19,25 12:3 30:18 45:19 LLP 2:7,12,17 3:2 localized 52:6 locate 23:15 located 34:10 location 24:8 logical 29:17 49:1 51:4 logically 48:24 long 10:13,13 13:19 look 27:9 32:23 33:12 50:13 loop 30:16 Los 5:10 losing 54:1,4 LT210 15:3,5,9,21 L-E-T-I 16:16	market 15:1 marketing 12:23 14:1 14:13 43:10 marketing-type 12:12 master's 7:24 material 46:24,25 47:7 materials 1:6 2:19 5:5 5:21 7:24 40:1 58:20 Matt 29:11,19 matter 5:3 54:17 61:10 may 22:9 36:23 43:21 47:14 54:14 maybe 32:22 35:7 May-June 16:3 mean 20:12 21:23 22:3 22:13 25:16,17 38:23 39:1 45:9 51:22 meaning 35:20 meant 23:8 meeting 55:25 meetings 54:21 55:2,18 55:21 57:11 Melnick 40:7 melnik 3:3 4:3 5:14,18 5:18 6:14 16:16,22 18:19 19:2,3 20:12,14 21:2 24:17 25:14,20 27:5,8,22 30:21 31:6 34:2 35:4,6 39:12,15 39:18,23 40:8,10 41:4 42:6 44:8 45:8 46:7 47:23 48:11 49:14,20 51:21 53:17 58:17 59:7,23 60:2,6 member 34:3,7 members 34:12 53:2 memo 30:22 31:1 memory 12:17 30:8 memos 34:18 35:13 mentioned 14:25 merge 48:5 Merit 61:4 Microelectronic 24:24 mid 15:17 middle 56:12 might 12:20 22:20 26:19 31:4 37:4 42:3 57:22 58:6,8 mind 24:15 39:7 42:18 57:2 Minnesota 7:25 10:4 minute 39:20 missed 26:20 mistranscribed 59:11 misunderstand 15:6 mixed 24:14 mixture 12:13 modify 20:12 moment 42:17 54:8 55:23 Monday 2:6 monitor 5:8 Montana 10:25 Montgomery 6:18 month 11:11 months 10:3 13:21,22	13:25 14:5 more 12:3 35:13 50:24 59:19 60:9 most 8:14,25 35:25 motivated 50:3,5 motivation 50:15,22 Motorola 9:16,22 moving 20:23 43:10 Mu 28:15,16 31:8 much 15:21 47:21 48:2 54:9 57:7 59:5 mutual 35:19 mutually 34:1 myself 45:6	58:16  O object 21:1 53:10,11 objection 21:6 24:5 25:4 27:17 30:24 34:22 35:1 39:9 41:1 41:8 44:23 45:21 48:9 51:9 objections 20:25 obligations 60:1 observation 46:16 48:18 observe 46:1 observed 46:20 47:20 observing 49:6 obviously 52:7 55:16 occasional 31:11 off 23:10 59:1 60:16 offer 7:13 offered 7:8 office 36:10,17 offices 2:7 official 7:15 often 17:4 Oh 23:24 52:14 54:24 56:13 okay 9:12 19:9,15,22 19:25 20:18 21:3 22:24 49:21 57:4,9 60:3 old 25:25 once 20:8 one 15:8 20:25 25:1 26:8,17 28:5,17,17 29:24 35:13 37:8,10 37:13 38:15,18 39:4 39:10 42:20 45:11,13 46:3,4,11 47:4,25 50:6,8 55:8 56:24 57:1 59:15,19,23 ongoing 60:1 only 10:12 18:4 23:16 30:10 31:1 37:10 43:7 53:23 58:1 on-barrier 45:10 46:10 46:16 47:4 48:3,16 49:10,22,25 50:5,16 52:3,7 oOo 4:7,9 open 38:25 operator 5:9 opinion 40:24 44:24 opposed 11:15 23:19 32:24 52:25 57:20 options 22:18 42:20 oral 35:12 61:9,15 orally 34:20 order 18:5 20:7,9,13 oregon 1:2,25 2:5,8 5:14 6:19 61:4,18,23 organization 10:2 53:3 other 9:5 14:21 15:11 18:3,11,14 24:1 28:4 28:8 31:7 32:18 33:18 34:12,16 45:14
K Kalispell 10:25 kearney 2:23 5:22,22 58:22 keep 32:5 keeping 30:15 kept 36:5,7 key 37:5,7 kind 32:1 36:20 47:25 kinds 48:6 knew 19:4,11,16 know 18:4 19:19 22:15 22:21,22,24 23:1 24:8 24:9,22 26:21 33:8,15 36:13 38:6,8,9 43:4,5 53:25 54:10,16 55:10 55:16 56:4 knowledge 12:19 35:23 40:17 58:11 knows 60:13	L labeled 32:18 laboratory 29:13 lacks 25:4 45:21 Lake 9:20 large-scale 12:16 last 24:18 29:18 47:14 late 9:23 11:12,15,17 44:17 later 11:19 40:22 41:9 43:1 laterally 51:14 law 2:6 7:6 lawsuit 18:9 lawyer 6:21,25 7:3 8:6 40:14 43:3 52:12 lawyers 9:6 18:4,12 32:25 56:11 57:12,16 57:17,21 layer 21:19 25:11,12,13 25:15,23 26:2,5 27:24 28:1 30:12 43:15 44:5,22 45:2,4,9,10 46:9,22 50:17,18,25 51:1,3,5 52:2 53:6,15 57:23 layers 21:16 22:10 lead 10:18 leading 20:25 21:1 24:5 25:4 27:17 30:24 41:16 44:12 48:9 learning 35:19 least 26:1 35:11 41:25 50:19 51:1 54:18 leave 9:22 18:25 19:18 36:14,16 led 39:11 40:22 43:1 left 8:12 11:21 23:25,25 36:3,11,17 53:19,22 Legalink 5:10	M made 29:15 32:17 36:20 41:2 43:21 48:25 make 7:14 8:17 41:20 57:5 makes 21:6 50:12 management 9:21 manager 12:5 13:13,20 29:14 43:12 managing 29:11 manella 3:2 5:15 MANGES 2:17 manufacturers 12:16 many 30:14 42:21 54:9 March 1:24 2:6 5:7 44:16 61:18 marginal 21:16,20,23 mark 39:19 marked 4:8 27:1,4 39:15,21,25	N N 4:1 naked 47:8 name 6:16,17 14:24 15:2 16:17 24:18 31:16 52:10 56:25 named 24:13 37:25 38:3 52:23,25 53:3 names 45:11 narrow 9:8 National 9:20,25 naturally 37:9 nature 17:10 50:21 nearly 47:16 neave 2:22 5:23 necessarily 25:12 29:10 47:22 48:25 56:2 need 34:25 59:18 needed 51:19 net 42:5 nevertheless 42:2 new 14:19,24 next 13:24 15:20 39:20 nine 13:21,22,25 14:5 nine-month 14:9,11 nitride 47:2,3,16,22,24 48:2,23 49:2,9,11 50:1,2 NMBS 10:20 NMOS 9:17 nod 8:17 nods 11:20 33:7 none 13:2,3,4,5 18:3 nonetheless 25:9 nonverbal 8:18,18 normal 8:17 normally 9:4 notarize 59:16 notary 59:16 noted 28:11 54:8 notes 12:1 61:F1 notice 8:11 40:15 noticed 5:14 novellus 1:19,23 2:3 3:4 5:3,19 6:10 20:3 nucleated 47:8 nucleation 45:18 46:2 48:4 number 10:16 15:22 16:1 36:9,19 39:20,22 41:17 43:6 52:17	



<p>exchange 17:16 20:20 excuse 48:17 55:23 56:20 exhaustive 43:13 Exhibit 27:1,2 32:23 38:2,11 39:5,16,17,18 39:19,25 40:20 42:25 58:9 EXHIBITS 4:8 existed 14:17 33:17 existence 43:24 existing 50:9 exists 41:3 expectations 17:20 experiment 16:2,2,24 16:24 28:6,9 29:4,5,9 29:20,23 30:5 31:23 32:6 33:2 experimental 31:13,22 32:14 experimentation 17:2 22:8 experiments 16:13 17:18 20:22 21:15 22:12 29:17 30:18 31:10 32:10 33:12 38:11 42:8,10 49:23 50:1,4 explaining 59:8 explicit 49:1 explicitly 31:25 32:3,13 34:17 39:2 explored 41:25 42:20 exposed 51:11 52:5 extent 17:24 19:15 22:3 23:20 extremely 45:24 47:19 54:12 eyelets 45:19 47:8,18 48:4,6,20 49:2 51:8 51:15</p> <hr/> <p><b>F</b></p> <p>fabricated 17:6 fabrication 10:19 facie 28:1 facilitate 31:1 facility 24:10 fact 7:9 21:17,20 32:15 46:21 48:19 50:10,13 51:5,10,15 53:23 54:17 56:3,20 facts 40:25 fair 19:2,24 20:6 28:3 fairly 12:18 fall 11:15,17 13:8 fallible 30:8 Falls 10:7 familiar 16:19 52:10 far 32:22 Feasibility 17:3 featured 14:22 features 50:10 Federal 2:4 fee 37:21 feedback 31:4</p>	<p>feel 44:19 59:17 feeling 21:19 ferroelectric 12:17 Fifth 2:7 5:13 figure 33:10 file 36:6,9,19 37:24 filed 38:1,6,9,13 filing 44:13,15 fill 22:14 25:3,7 26:10 filled 21:21 filling 25:9 film 47:19 48:22 49:6 51:16,17 films 47:20 final 27:14,19 find 30:23 37:3 39:22 findings 35:20 Fine 21:7 60:7 firm 7:6 54:19 first 6:10 8:7,9 9:13,15 9:15 13:9 40:1 fish 2:22 5:22 flaws 50:13,14,20 Flemish 24:25 focus 14:19 15:4 25:22 26:3 30:11 focused 15:9 following 7:10 9:19 follows 6:11 forbidden 32:4 foregoing 61:10,13 foreknowledge 47:13 form 21:1 34:22 47:17 49:2 formal 33:16 formation 9:17 formed 49:6 formulation 46:18 formulations 42:22 forth 13:17 43:23 61:7 Fortino 2:14 6:1 found 36:7 41:24 foundation 25:5 39:9 45:22 51:9 fraction 17:13 frame 13:8 15:18 16:3 16:13 21:24 23:17 43:7 44:9,18 frames 43:9 free 33:11 59:17 French 16:17 frequently 9:6 17:2 30:14 50:11 Friend 6:4 from 5:24 6:1 7:20 10:7 14:21 16:6,7,10,10,23 17:1,3,8 22:10 26:13 26:14 29:18 35:25 37:13 45:6,6,6 47:5 48:4 50:3 51:14 54:15,18 56:24 60:1,9 frost 11:13 FSI 10:3 full 6:16 26:3 61:14 full-thickness 51:19 full-time 28:24</p>	<p>functionality 15:19 functioning 29:13 fundamental 15:23 Funny 43:3 further 41:19 42:3 58:18 60:4</p> <hr/> <p><b>G</b></p> <p>gather 29:18 gave 15:10 56:25 general 43:11 generalize 46:1,6 generally 44:22 47:9 52:19,21 gentleman 24:12 getting 24:14 give 8:10,18 17:16 20:20 34:11,25 39:24 given 17:11,13 56:1,3 giving 57:2 go 8:24 9:24 10:17 28:22 33:10 34:24 50:4 56:13 goes 45:11 going 9:14 18:20 19:7 19:13,18 43:8 53:9 55:23 60:12 good 51:11,23 59:25,25 60:3 gotshal 2:17 5:20 grab 59:23 graduated 7:20 Grail 50:16 greater 57:15 Grenoble 24:4,9,9 Gressi's 24:8 grew 45:3,13 46:9 group 13:14 28:18 34:4 34:5,6,12 43:12 53:2 grow 46:11 guess 8:10 14:17 21:4 23:7 24:11 29:25 32:21 51:23</p> <hr/> <p><b>H</b></p> <p>hampered 51:2 hand 59:14 61:17 Handing 40:8 happened 38:8 hard 37:12 Harry 3:8 6:1 56:8 57:5 57:25 Hass 11:2 having 28:13 41:1 44:20 51:1 55:18 head 11:20 23:10 33:7 heal 22:10 hear 35:3 held 12:8 help 14:6 23:15 33:1,6 44:15 helps 35:15 Henry 28:11,19,20,20 45:6 her 59:23 highlighted 25:7 31:24</p>	<p>33:18 highly 1:19 18:13,17,20 20:1 46:2 high-aspect 50:10 high-rate 51:19 him 28:23 30:15,22,25 35:12 54:13,25 hired 20:8 history 9:13 10:14 Holy 50:16 home 8:25 50:23 hour 2:8 8:25 huh-uh 8:19 Hypothetical 33:14 47:11</p> <hr/> <p><b>I</b></p> <p>idea 17:15 20:19 21:8 51:10,15 52:4 identification 32:17 identified 32:13,15 40:15 identify 5:16 IMAC 24:16 IMEC 24:13,20,22 26:14 34:11 55:11 56:16,22 57:1 imperfectly 50:11 implementation 29:12 30:20 implemented 12:20 importance 43:15 important 8:15,16,19 8:24 9:9 41:20 importantly 9:1 14:23 impossible 46:1,6,19 improve 22:10 31:4 inadequacy 50:9 inc 1:3,6,9,13,16,19,23 2:3,20 3:5,7 5:6 6:10 incapable 21:21 48:22 included 38:10 45:5 including 8:25 43:22 57:8 inclusive 61:14 incomplete 8:2 independent 22:8,12 28:16 indicated 22:18 25:9 individual 28:17 35:24 individuals 28:10 31:8 34:16 58:10 industry 9:16 46:18 inert 47:17 inexpensive 17:5 influence 40:21 influenced 38:16 42:25 information 1:20 18:7 18:8,23 19:1,1,4,5,10 19:11,16,19 33:21 34:14 infrastructure 14:16 inherited 36:3,12,13 initial 30:4 48:4 initiate 48:2 input 29:6 45:5</p>	<p>Institute 24:24 instructions 17:21 Intel 16:3,6,6,10,24 17:9,12,14,15,17 18:6 18:14 19:1,9,19 20:19 20:21 21:12,20 26:24 27:15 28:15,15 31:7 31:21 32:3 33:3,10,19 33:23 38:10 Intel's 17:20 21:9 intensive 56:4 interacting 31:9 interest 22:9 interesting 30:23 36:8 interim 27:21 internal 32:6 internally 17:5 39:2 International 10:10 interposing 20:24 interrogatories 40:2 interrogatory 40:3 58:14,15 introduced 15:1,2,14 introduction 14:19 15:12 invented 44:21 45:1 inventor 37:25 38:4 52:23,25 inventors 53:3 investigated 41:17 involved 28:13,15 31:9 43:6,12 44:7 45:5 47:13 53:15 involvement 30:3,19 involves 18:6,14 involving 31:12 in-depth 12:18 In-House 3:8 irell 3:2 5:14,18 isolated 47:18 issue 33:25 56:9 issued 39:11 I-M-E-C 24:20</p> <hr/> <p><b>J</b></p> <p>J 2:4 61:3,22 Japan 8:1 10:21 Jared 2:18 5:20 Jeff 28:12 29:7,12 40:12 Jeff's 29:10 Jerry 2:13 5:24 Jick 31:12,12 Jin 28:14 31:8 job 9:13,15,15 12:11,12 13:9 Johnson 29:19 Johnson's 29:12 joined 11:5 joint 33:16 journal 23:9 journals 23:19 judge 57:9 just 12:1 14:9 18:12 20:13 24:2 27:1,5,15 30:5 34:19,25 37:2</p>
---	--	--	---	--



44:2 58:16 rise 15:10 Ritzdorf 28:13 34:15 34:20 35:11,17,18,24 44:7,20 45:6 RMR 61:22 Rodel 11:3 Roger 24:13 56:25 Rohm 11:2 role 12:6,14 28:19 29:4 29:10 43:10 roles 9:21 43:7 Roman 3:3 5:14,18 rough 15:16 roughly 10:8 15:17,17 RPR 61:22 Rules 2:4 run 16:13 50:23  <hr/> S <hr/> Salt 9:20 same 15:21,25 16:13 22:6 24:12 27:3 37:14 55:7 57:6 saw 23:1 26:13 saying 8:13 24:11 43:3 48:25 49:1 says 40:11 scheduled 60:8 science 7:22,24 8:5 scope 22:15 31:2 se 38:14 search 26:18,21 34:9 35:16 36:24 searches 37:11,23 searching 23:2 second 50:8,8 sector 9:18 see 17:23 20:15 27:10 32:24 44:15 47:25 seed 21:16,19 22:4,10 22:13 25:2,11,12,13 25:15,16,23 26:2,5,10 26:11,11 27:24 28:1 30:12 38:7,13,19 39:2 39:6 40:21 42:8,9,18 43:15 44:5,22 45:2,10 46:9 48:7,17,19 49:5 49:7,12,13 50:4,17,18 50:25,25 51:3,5 52:1 52:2 53:6,15 55:3,6 55:12,22 56:9,17 57:12,23 seem 22:16 seen 22:20 Semicon 15:17 semiconductor 9:20,25 10:20 15:24 37:7 semitool 1:3,9,16 3:7 5:3,4,5,25 6:2 7:11 10:25 11:5,22 13:7,11 13:20 14:18 16:11 17:11,14,16,17,22 18:24 19:5,11,16,20 20:20,20 23:3,22,25 26:22,23 30:10 31:9	32:19 33:9 36:3,11 37:19 38:1,6,9 40:15 43:11,17 52:12 53:10 54:19 55:3,19 57:18 58:21 Semitool's 14:15 28:22 39:25 43:21,23 58:13 send 59:9,15 sensitive 45:24 sensitivities 46:14 separate 50:7 sequence 26:8 29:17 sequential 49:1 series 30:18 set 16:12 33:11 40:1 61:7 sets 25:2 several 9:3 25:24 share 17:17 20:21 21:12 shared 55:10 sheathed 50:11 Shipley 7:9 9:14 11:2 36:11 short 10:3 30:11 35:1 49:14 Shorthand 2:5 61:4,23 shortly 43:8,9 show 26:25 Shu 28:14 31:8 side 31:7 significant 36:21 significantly 56:22 silicon 9:18 similar 16:12 42:12 48:7 simply 37:22 Since 8:6 20:23 21:3 single-substrate 13:16 14:21 sit 37:17 situation 51:12 six 9:19 10:3 skilled 41:15 skim 40:3 small 52:6 smile 10:11 smiling 10:12 solicit 31:3 solvent 13:17 some 7:5 25:7 26:1 28:24 34:1 40:16 50:1,1,2 51:11 52:6 52:15 59:9 something 8:20 19:18 24:25 36:6 48:23 54:14 55:24 59:18 sometimes 26:10 32:9 56:11 sorry 11:6,10 13:3 15:4 16:15 19:7,9 20:18 23:7 25:21 30:6 34:24 39:10 44:10,14 48:12,14 sort 14:20 27:14 32:21 36:6 47:7 48:6 51:7	sound 16:17 sounds 16:19 sources 17:3 Southwest 5:13 6:18 span 37:12 speak 9:4 36:21 50:17 specialty 10:19 specific 29:6,8 37:21 55:4,5,25 56:7,23 57:17,20 specifically 15:9 16:10 17:7 26:16 29:3 30:12 32:14 33:17 35:17 36:15,17 50:25 52:24 53:20 54:7 57:3 specifics 19:13 speed 23:6 spell 24:18 31:16 Sperry 10:4,6 spoke 42:17 spring 10:24 11:1 Springs 10:23 12:9 stamp 27:6 61:17 stamps 32:24 stand 24:22 standpoint 35:25 stands 24:23 start 14:4 20:24 started 12:5 13:7 14:7 starting 9:13 state 5:17 6:15 8:4 45:18,25 46:2,15,19 statement 33:19 STATES 1:1 stay 15:21 stenotype 61:9 step 26:10 steps 37:2 Stevens 28:12,19,20 45:7 still 21:4 33:9 41:2 stint 10:21 stop 40:11 strategy 43:22 structures 12:21 17:6,8 studies 17:4 stuff 20:24 32:24 40:14 subject 28:1 31:25 57:12 58:17,20,22 submitted 59:20 subpoenas 18:10 subscribing 37:21 subsequent 51:19 54:15 subsequently 48:5 49:3 subsidiaries 11:2 substance 43:20,25 53:12 substantive 20:24 28:14 subtracting 14:5 success 42:2 successful 46:23 49:11 successfully 49:3 suggest 51:22	suggestion 16:5,6 suggestions 37:4 suit 18:15 Suite 2:8 summarize 20:13 summarized 29:24 summary 27:14,19 summer 11:15 60:9 summertime 11:15 summer-early 11:17 super-fill 51:20 supplement 24:11 59:13 supplemental 39:25 59:14,17 supplementary 25:8 sure 29:15 30:9 34:14 35:9 57:5 surface 45:24 46:15 52:8 swear 6:5 sworn 6:10 system 14:17 15:10 29:16 systems 1:19,23 2:3 3:4 5:3,19 6:10 8:5 S.W 2:7  <hr/> T <hr/> T 2:14 take 8:1 27:9 45:15 49:14 58:24 taken 1:23 2:2 49:17 59:2 taking 5:12 8:12 12:1 37:11,13 56:6 talking 15:23 57:6 58:3 tantalum 47:2,3,16,22 48:23 49:8,8,9,10,11 50:1 tape 5:2 tasked 13:13 Tateyama 10:20 taylor 1:22 2:2 4:2 5:2 6:8,15,17,20 7:17 53:9 59:5,7 61:6 team 10:18 57:15 58:5 technical 12:22 35:25 57:15 58:5 techniques 41:12 technologies 1:13 5:6 58:12 technology 10:19 12:7 12:10,18,19 13:6 22:9 22:12 23:5 25:10 26:4,6 34:5,6,12 38:14 45:4 tell 7:17 9:12 17:24 18:3 19:6,18 20:3,4 21:4 23:14 32:22 55:24 temporary 11:14 tend 9:8 27:20 tenure 7:10 43:11 terms 20:9 29:4 Terrence 2:23	Terry 5:22 testified 40:25 testifies 6:11 testimony 59:17 61:9 61:15 thank 20:2 27:7 40:9 40:13 41:10 44:2 59:5 60:15 their 9:18 17:20 22:15 24:9 26:2 33:24 thereof 61:16 thesis 8:2 thickness 26:4 thin 46:21 49:12 51:16 thing 51:23 things 8:11 47:14 50:6 think 11:25 18:11 39:19 54:14 57:7,9 60:10,13 thinking 14:6 35:21 42:23 56:16 third 37:8 Thoma 3:12 5:9 thomas 1:22 2:2 4:2 6:8 6:17 61:6 though 14:18 25:23 43:7,12 46:20 50:13 55:24 three 36:18 through 9:25 22:1 28:2 51:6,23,25 Ti 47:24 50:1 time 5:8 7:13 9:14,17 10:1,3 11:1 13:8 14:2 15:16,18 16:3,13 19:4 19:11,20 21:14,24 23:4,17 24:12 28:21 28:24 29:15,22 30:11 35:1,23 36:10 37:12 37:12,14 38:12 43:7,9 44:9,11,18,19 47:6,12 47:15 49:19 59:19 61:7,8 times 9:4 32:9 54:13 titanium 48:2 49:2 today 5:9 today's 5:7 6:21 7:5 token 55:7 told 8:6 Tom 5:2 28:12 34:15 35:16,18,23 44:6,20 45:6 tool 14:19,24 15:1 29:15 tools 15:7 top 23:10 25:16,17 26:1 26:9 topic 28:14,17 56:1 57:19 58:4 topics 35:21 track 54:13 transcribed 61:11 transcript 8:16 18:1 20:1 59:10 61:13 transcription 61:12 transfer 12:16 33:21
--	---	--	--	--

46:12 55:9 57:21 58:3,12 61:9 others 17:6 37:13 41:24 50:2 out 16:17 33:10,13 38:24 45:3,13 46:9,11 outside 28:18 over 8:14 15:20 32:22 32:23 37:11 49:24 52:7 59:10,16 overall 50:18 oversaw 29:14 overseeing 13:14 own 35:21 oxidized 46:5	perspective 36:1 Pete 56:8,19 57:3,8 phenomenon 47:21 phonetic 24:8 Ph.D 8:3 30:13 piece 33:22 place 5:12 18:5 37:11 37:14 41:8 44:5 56:6 61:7,8 placements 14:17 Plaintiff 1:4,10,17 2:15 Plaintiff's 39:17,18 plating 28:2 38:5 46:16 48:3,16 49:10,22,25 50:5,16 51:7 52:7 please 5:16 6:5,15,16 7:17,19 8:21 9:12,24 10:17 20:17 34:24 35:8 44:1 56:20 59:17 pleasure 59:6 point 7:5 19:2 40:2 45:17 47:6 59:9 60:1 Pollett 54:16,17,22 55:2,6,11 57:22 58:1 poor 51:3 portion 17:25 18:13,19 19:25 Portland 1:25 2:8 5:13 6:19 8:4 61:17 pose 9:7,8 position 8:1 10:9,18,24 12:8 13:24 14:1 positions 13:23 14:5 possession 18:24 possible 36:22 41:21 42:5 possibly 11:19 40:16 potential 16:21 44:3 48:20 potentially 51:13 56:5 practice 40:18 60:4 precedes 18:23 preceding 21:11 precisely 11:10 preexisting 26:2 32:24 46:22 49:12 50:14 preferred 41:22 42:16 46:17 47:1 preparations 17:21 prepared 21:3 presence 51:25 PRESENT 3:11 presentations 14:22 pretty 15:21 57:7 previous 39:8,22 previously 26:25 27:4 39:16,24 Prima 28:1 primarily 12:11,11 principal 15:11 21:18 25:22 26:2 29:13 Principally 35:18 prior 7:5 8:1 9:17 26:10,23 35:20 36:6 41:2 54:4	privilege 43:18 53:11 Procedure 2:4 proceed 7:2,15 proceeded 7:23 48:4 proceeding 23:9 proceedings 23:20 61:10,16 process 10:5 12:6 13:13 13:14,19 17:1 21:9,19 21:22 26:8 29:1 30:14 31:3 33:24 36:1 42:14,18 45:16 45:17,23 47:25 50:7 50:13,19,20 51:2,3 processes 22:8 42:22 50:9 processing 13:16 14:21 product 9:18 production 9:21 Productions 3:12 Professional 61:5 Professor 38:24 program 8:3 properly 47:4 proprietary 12:17 protectable 56:6 protective 20:7,9,13 provide 52:11 provided 19:1 56:18 providing 21:20 22:4 public 22:17 37:23 published 22:17 23:17 23:18 24:7 pumpkins 11:14 purged 36:23 purges 36:19 purpose 15:23 30:22,25 purposes 39:2 pursuant 2:3 18:9 pursue 7:23 pursued 38:15,22,23 39:1 put 32:25 55:8 puzzling 32:21 49:24 PVD 21:16 26:6,9 45:4 48:7,21 49:7,13 50:12 51:5 52:1 PVD-deposited 50:25 PVD/CVD 25:16 P-a-l-m-a-n-s 24:19	Ramtron 10:10,18,23 12:4,5,15,24 Ramtron's 12:17 ran 24:12 rather 8:19 10:13 30:1 51:24 ratio 50:10 read 35:5 58:9 59:10 readily 17:5 really 23:8 43:3 reason 18:25 21:18 45:13 56:10 reasonable 8:25 recall 10:2 11:6 43:8 16:11,18 21:14,17 22:16 24:15 26:13,18 27:18 29:6,7 30:3 31:14,24 32:1,8 34:16 34:21 35:14 37:20 43:14 52:24 53:14 54:18,24 55:4,5,7,8 55:14,18,21 56:7,22 56:23 57:2,10,11,16 58:3,6 recalled 60:4 recalling 16:20 recess 49:17 59:2 recollection 11:23 16:8 17:9 23:16,21,23 24:3 24:6 25:1,6,24,25 28:10,25 29:21 30:9 30:17 31:11 32:2 36:19 38:12 41:11,19 42:19 44:25 48:1 54:2,11 56:21 57:25 record 6:16 35:5 41:9 49:18 59:1,3 60:16 61:15 records 28:22 recruited 10:4 redirect 58:17,20,23 reduction 40:17 refer 33:20 referred 26:12 referring 38:19 58:13 regarding 40:17 Registered 61:4,5 relate 12:25 52:19,22 related 13:5 26:16 38:4 43:13 55:22 57:23 58:12 relating 27:23 54:22 55:2,3 relationship 46:11,13 relatively 30:11 relied 35:25 remain 13:19 remained 15:25 23:21 remember 11:4,8,10,12 11:13,21 14:6,9 15:13 15:16,19 16:1,4,12,23 17:24 22:4,5,19 25:24 26:20 27:10,12,13 33:1,6 34:13,18 35:15 37:15,18 42:7,9,11,15 52:9,14 53:4,5,18,21	53:23 54:3,6,9,25 55:1,25 56:2,14,18 57:14,21 REMEMBERED 2:1 repair 22:14 25:3,12 26:11 30:13 38:7,13 38:20 39:3,6 40:21 42:8,9,18 44:5,22 45:2 46:9 48:17,19 49:5 50:4,17 52:2 53:6,15 55:3,6,12,22 56:9,17 57:12,23 repeat 9:3 35:7,8 59:8 repertoire 41:15 replaced 14:20 replacement 45:4 report 27:14,19,23 33:21 reported 61:8 reporter 2:5 6:3,5 8:12 59:9,21,22 61:4,5,5 61:24 reporter's 27:6 represent 5:17 7:8 representation 7:16 represented 6:20 representing 7:7 requested 35:5 required 12:18,22 requirement 26:6 50:7 50:24 Research 7:25 10:7 24:24 researchers 24:4 reservation 58:23 respect 17:21 29:3,8,25 30:4 31:10 35:21 38:1 58:5 respond 9:6 response 7:12 58:14,15 responses 40:1 responsibilities 12:24 13:5,12 14:12 responsibility 13:9 responsible 12:14 rest 40:14 restate 19:7 20:17 restatement 32:7 results 17:17 20:21 21:12 29:24 31:22 32:4,5,11,14 35:16 50:3 51:2 retained 36:22 54:19 57:18 retrace 37:2 reveal 43:20 riedinger 2:13 5:24,24 16:15 18:22 20:6,23 21:5 24:5 25:4,19 27:3,7,17 30:7,24 33:14 34:22,25 39:9 40:6,9,24 41:6,8 43:16 44:23 45:21 47:11 48:9 51:9 53:9 58:24 59:4,21 60:8,15 right 6:25 10:15 41:7
--	--	---	--	---

09:58:51 11:15	10:03:00 14:6	10:07:46 16:25 17:1	10:10:57 19:24	10:14:30 22:20
09:58:54 11:16	10:03:02 14:7	10:07:58 17:2	10:10:58 19:25	10:14:32 22:21
09:58:57 11:17	10:03:03 14:8,9	10:08:00 17:3	10:11:03 20:1	10:14:34 22:22
09:58:59 11:18,19	10:03:08 14:10,11	10:08:03 17:4	10:11:07 20:2,3	10:14:37 22:23
09:59:01 11:20,21	10:03:24 14:12	10:08:07 17:5	10:11:09 20:4	10:14:40 22:24
09:59:09 11:22,23	10:03:25 14:13	10:08:10 17:6	10:11:11 20:5	10:14:42 22:25
09:59:12 11:24	10:03:26 14:14	10:08:14 17:7	10:11:12 20:6	10:14:43 23:1
09:59:22 11:25	10:03:29 14:15	10:08:16 17:8	10:11:13 20:7	10:14:46 23:2
09:59:23 12:1	10:03:33 14:16	10:08:19 17:9	10:11:16 20:8	10:14:50 23:3
09:59:26 12:2	10:03:40 14:17	10:08:23 17:10	10:11:19 20:9	10:14:53 23:4
09:59:28 12:3	10:03:46 14:18	10:08:24 17:11	10:11:21 20:10	10:14:57 23:5
09:59:31 12:4	10:03:49 14:19	10:08:28 17:12,13	10:11:23 20:11	10:15:02 23:6,7
09:59:33 12:5	10:03:54 14:20	10:08:30 17:14	10:11:24 20:12	10:15:05 23:8
09:59:36 12:6	10:03:58 14:21	10:08:38 17:15	10:11:26 20:13	10:15:07 23:9
09:59:44 12:7	10:04:00 14:22	10:08:41 17:16	10:11:28 20:14,15	10:15:09 23:10
09:59:47 12:8	10:04:11 14:23	10:08:44 17:17	10:11:30 20:16,17	10:15:11 23:11,12
09:59:51 12:9	10:04:14 14:24	10:08:47 17:18,19	10:11:33 20:18	10:15:13 23:13
09:59:55 12:10	10:04:16 14:25	10:08:50 17:20	10:11:34 20:19	10:15:14 23:14
09:59:58 12:11	10:04:17 15:1	10:08:54 17:21	10:11:37 20:20	10:15:16 23:15
	10:04:19 15:2	10:08:56 17:22	10:11:42 20:21	10:15:17 23:16
	10:04:23 15:3	10:08:59 17:23	10:11:44 20:22	10:15:22 23:17
	10:04:31 15:4	10:09:02 17:24	10:11:45 20:23	10:15:30 23:18
	10:04:33 15:5	10:09:06 17:25	10:11:47 20:24	10:15:34 23:19
	10:04:38 15:6	10:09:09 18:1	10:11:49 20:25	10:15:37 23:20
	10:04:40 15:7	10:09:10 18:2	10:11:51 21:1	10:15:44 23:21
	10:04:43 15:8	10:09:12 18:3	10:11:55 21:2	10:15:50 23:22
	10:04:45 15:9	10:09:18 18:4	10:11:56 21:3	10:15:56 23:23,24
	10:04:49 15:10	10:09:20 18:5	10:11:57 21:4	10:16:00 23:25 24:1
	10:04:52 15:11	10:09:22 18:6	10:12:00 21:5	10:16:03 24:2
	10:04:54 15:12	10:09:25 18:7,8	10:12:03 21:6	10:16:07 24:3
	10:04:58 15:13	10:09:27 18:9	10:12:05 21:7,8	10:16:09 24:4
	10:05:00 15:14,15	10:09:30 18:10	10:12:09 21:9	10:16:15 24:5
	10:05:01 15:16	10:09:34 18:11	10:12:12 21:10	10:16:17 24:6
	10:05:05 15:17	10:09:37 18:12	10:12:16 21:11	10:16:19 24:7
	10:05:14 15:18	10:09:41 18:13	10:12:22 21:12	10:16:22 24:8
	10:05:24 15:19	10:09:42 18:14	10:12:24 21:13	10:16:28 24:9
	10:05:29 15:20	10:09:46 18:15	10:12:35 21:14	10:16:32 24:10
	10:05:33 15:21	10:09:48 18:16	10:12:39 21:15	10:16:33 24:11
	10:05:36 15:22	10:09:49 18:17	10:12:45 21:16	10:16:35 24:12
	10:05:38 15:23	10:09:52 18:18	10:12:50 21:17	10:16:39 24:13
	10:05:41 15:24	10:09:53 18:19	10:12:55 21:18	10:16:43 24:14
	10:05:44 15:25	10:09:55 18:20	10:12:59 21:19	10:16:46 24:15
	10:05:45 16:1	10:09:57 18:21,22	10:13:04 21:20	10:16:48 24:16
	10:06:09 16:2	10:09:58 18:23	10:13:07 21:21	10:16:51 24:17,18
	10:06:14 16:3	10:10:01 18:24	10:13:10 21:22	10:16:54 24:19
	10:06:16 16:4	10:10:05 18:25 19:1	10:13:11 21:23	10:16:59 24:20
	10:06:18 16:5	10:10:06 19:2	10:13:16 21:24,25	10:17:02 24:21
	10:06:30 16:6	10:10:08 19:3,4	10:13:20 22:1	10:17:03 24:22
	10:06:34 16:7	10:10:10 19:5	10:13:24 22:2	10:17:04 24:23
	10:06:35 16:8	10:10:12 19:6	10:13:37 22:3	10:17:08 24:24
	10:06:39 16:9	10:10:13 19:7	10:13:39 22:4	10:17:11 24:25
	10:06:43 16:10	10:10:16 19:8	10:13:43 22:5	10:17:16 25:1
	10:06:47 16:11	10:10:17 19:9	10:13:46 22:6	10:17:19 25:2
	10:07:04 16:12	10:10:21 19:10	10:13:47 22:7	10:17:23 25:3
	10:07:05 16:13	10:10:24 19:11	10:13:54 22:8	10:17:25 25:4
	10:07:09 16:14	10:10:27 19:12,13	10:13:57 22:9	10:17:27 25:5
	10:07:10 16:15	10:10:30 19:14	10:13:59 22:10	10:17:29 25:6
	10:07:11 16:16	10:10:33 19:15	10:14:06 22:11	10:17:31 25:7
	10:07:15 16:17	10:10:35 19:16	10:14:08 22:12	10:17:34 25:8
	10:07:17 16:18	10:10:38 19:17	10:14:12 22:13	10:17:38 25:9
	10:07:20 16:19	10:10:40 19:18	10:14:14 22:14	10:17:43 25:10
	10:07:23 16:20	10:10:43 19:19	10:14:17 22:15	10:17:47 25:11
	10:07:26 16:21	10:10:48 19:20	10:14:18 22:16	10:17:51 25:12
	10:07:31 16:22	10:10:50 19:21	10:14:21 22:17	10:17:55 25:13,14
	10:07:40 16:23	10:10:51 19:22	10:14:24 22:18	10:18:00 25:15
	10:07:43 16:24	10:10:56 19:23	10:14:29 22:19	10:18:03 25:16

transmittal 33:21 tremendous 46:14 trial 60:8,11,13 triangulate 14:3 43:9 tried 37:3 true 61:14 try 8:22 16:16 17:23 33:12,13 trying 20:13 37:2 Turner 28:12 29:7 40:12 two 7:15 12:7,13 24:14 30:7 31:8 37:10 47:15 50:6 51:5 58:1 type 59:13 typical 33:24 typically 32:12 48:3	8:14 49:18 59:1,3 60:16 videotaped 1:22 2:1 videotaping 8:14 view 40:19 voice 5:16 Volume 5:1 voluntary 53:24 vs 1:5,11,18 5:3,4,5	39:10 41:1,7,10 44:2 44:25 45:23 47:12 48:10 49:16 51:10 53:13 56:12,13 59:6 59:19,22,25 60:3,7,13 60:14 61:17 witnesses 60:11 wonder 18:19 wondering 14:3 60:12 word 37:7 words 18:3 32:18 37:5 work 8:2,11 10:2,22 11:1 12:4 15:5 16:5 16:21 27:15,24 31:25 32:2 38:2,4,10 40:20 40:21,22 41:16 42:1 42:24 43:1 44:6,12 46:9,10,21 50:2 52:2 52:3,15 54:10 56:6,22 worked 9:19 52:18 53:2 workers 38:24 working 8:1 13:15 29:1 works 21:4 wouldn't 19:21 write 27:2 59:14 writing 41:20 written 8:16 27:20 38:17 42:4 wrote 34:18 35:12	09:51:15 5:18 09:51:18 5:19 09:51:19 5:20 09:51:20 5:21 09:51:23 5:22 09:51:25 5:23 09:51:27 5:24 09:51:28 5:25 09:51:32 6:1 09:51:35 6:2 09:51:38 6:3 09:51:39 6:4 09:51:42 6:5 09:51:43 6:6 09:51:44 6:7 09:51:52 6:14 09:51:53 6:15 09:51:55 6:16 09:51:57 6:17 09:51:59 6:18 09:52:04 6:19 09:52:07 6:20 09:52:11 6:21 09:52:12 6:22 09:52:14 6:23 09:52:16 6:24,25 09:52:20 7:1 09:52:21 7:2 09:52:23 7:3,4,5 09:52:31 7:6 09:52:35 7:7 09:52:37 7:8 09:52:42 7:9 09:52:45 7:10 09:52:49 7:11 09:52:50 7:12,13 09:52:54 7:14 09:52:58 7:15 09:53:01 7:16,17 09:53:14 7:18 09:53:20 7:19,20 09:53:22 7:21 09:53:27 7:22 09:53:31 7:23 09:53:35 7:24 09:53:37 7:25 09:53:42 8:1 09:53:45 8:2 09:53:46 8:3 09:53:49 8:4 09:53:52 8:5 09:53:54 8:6 09:54:05 8:7 09:54:07 8:8,9 09:54:08 8:10 09:54:11 8:11 09:54:13 8:12 09:54:15 8:13 09:54:18 8:14 09:54:22 8:15 09:54:24 8:16 09:54:28 8:17 09:54:32 8:18 09:54:35 8:19 09:54:38 8:20 09:54:40 8:21	09:54:42 8:22 09:54:45 8:23 09:54:46 8:24 09:54:51 8:25 09:54:53 9:1 09:54:55 9:2 09:55:02 9:3 09:55:04 9:4 09:55:08 9:5 09:55:10 9:6 09:55:14 9:7 09:55:18 9:8 09:55:21 9:9 09:55:23 9:10 09:55:24 9:11,12 09:55:36 9:13 09:55:42 9:14 09:55:44 9:15 09:55:50 9:16 09:55:57 9:17 09:55:59 9:18 09:56:01 9:19 09:56:06 9:20 09:56:13 9:21 09:56:16 9:22 09:56:17 9:23 09:56:20 9:24 09:56:22 9:25 09:56:25 10:1 09:56:29 10:2 09:56:34 10:3 09:56:38 10:4 09:56:44 10:5 09:56:49 10:6 09:56:53 10:7 09:57:00 10:8 09:57:06 10:9 09:57:09 10:10 09:57:13 10:11,12 09:57:17 10:13 09:57:20 10:14 09:57:21 10:15 09:57:23 10:16 09:57:24 10:17 09:57:25 10:18 09:57:28 10:19 09:57:34 10:20 09:57:40 10:21 09:57:43 10:22 09:57:45 10:23 09:57:58 10:24 09:58:01 10:25 09:58:04 11:1 09:58:11 11:2 09:58:15 11:3 09:58:16 11:4 09:58:21 11:5 09:58:23 11:6 09:58:26 11:7 09:58:28 11:8 09:58:31 11:9 09:58:34 11:10 09:58:37 11:11 09:58:39 11:12 09:58:41 11:13 09:58:45 11:14
uh-huh 8:20 ultimately 15:10 28:23 uncovered 37:23 under 15:2 52:15 53:18 53:22 61:12 understand 6:24 9:11 20:11 56:10 understanding 32:5,7 32:10 33:19 41:2 46:20 understood 20:5 41:15 53:13 60:14 underway 31:2 unfamiliar 23:4 UNITED 1:1 University 7:21,24 8:4 unless 32:14 unquestionably 35:24 until 10:23,25 12:8 22:23 unusually 10:13 uptake 31:1 use 21:10 37:5,19 41:9 49:12 used 42:11 using 37:16,22 46:3 61:11 Utah 7:21 utility 14:15 utilization 29:14 U.S 23:19	<b>W</b> wafers 16:23 17:1,3,11 17:13,16 20:20 21:10 wait 22:23 39:20 waived 43:18 53:11 Walter 6:4 want 43:16 56:21 57:5 59:12 60:11 wanted 33:10 wasn't 12:2 49:11 51:10 way 9:4,7,9 12:25 22:6 26:12 27:20 30:15 38:16 43:3 46:4,8 51:11 55:8 ways 31:4 weeks 7:15 weil 2:17 5:20 welcome 59:13 well 12:23 13:22 18:22 19:22 20:6,10,11 28:4 36:4 40:13 45:14 58:8 went 10:2,6,22 11:1 37:3 were 7:6 13:12 14:12 15:22 16:25 17:9,11 17:13 19:5,11,16,20 22:13,18,19,22,24 23:17,18 24:4,7,7,15 25:23 26:16 28:5,15 31:2,9 32:3,9,10,13 32:14 33:9 34:3,10,17 36:17,18 37:11,13,15 37:18,20,20,21,22,23 37:25 38:17 40:20 41:12,14,15,25 42:2,4 42:12,13 43:8 44:7,19 49:21 50:10,14 52:2,5 52:23 53:3 54:12 55:12 56:17 57:10 58:1,13 61:11 West 15:17 wet 13:16 we'll 18:12 19:25 59:15 we're 8:15 15:23 20:23 54:11 57:5,9 we've 27:15,24 while 7:25 23:3 54:8 whole 50:15,22 61:16 William 3:12 5:9 Wisconsin 10:7 witness 6:6,9 11:20 16:18 20:11 24:6 25:6 27:18 30:8,25 33:15 34:24 35:2	<b>X</b> X 4:1 <b>Y</b> Yeah 11:18 35:4 year 15:20 60:9 years 9:19 10:15 12:7 25:24 36:18 47:15 Yu 31:12 Y-u 31:17 <b>0</b> 01-CV-1066-BR 1:3 5:5 01-CV-873-BR 1:9 5:6 01-CV-874-BR 1:16 5:4 0308 6:18 09:50:14 5:1 09:50:16 5:2 09:50:18 5:3 09:50:21 5:4 09:50:27 5:5 09:50:34 5:6 09:50:41 5:7 09:50:45 5:8 09:50:50 5:9 09:50:53 5:10 09:50:58 5:11 09:51:00 5:12 09:51:02 5:13 09:51:06 5:14 09:51:09 5:15 09:51:11 5:16 09:51:13 5:17	<b>U</b> uh-huh 8:20 ultimately 15:10 28:23 uncovered 37:23 under 15:2 52:15 53:18 53:22 61:12 understand 6:24 9:11 20:11 56:10 understanding 32:5,7 32:10 33:19 41:2 46:20 understood 20:5 41:15 53:13 60:14 underway 31:2 unfamiliar 23:4 UNITED 1:1 University 7:21,24 8:4 unless 32:14 unquestionably 35:24 until 10:23,25 12:8 22:23 unusually 10:13 uptake 31:1 use 21:10 37:5,19 41:9 49:12 used 42:11 using 37:16,22 46:3 61:11 Utah 7:21 utility 14:15 utilization 29:14 U.S 23:19 <b>V</b> vaguer 56:24 variants 41:18 variety 12:21 17:3 41:12 Ventura 5:10 versa 8:22 versus 11:12 very 9:8 10:3 14:22 17:4 42:12 50:10 51:16,16 52:6 59:5,25 59:25 60:3 vice 8:22 video 3:12 5:8,8,12 videographer 5:1 6:3	

10:18:08 25:17	10:23:08 28:13	10:27:28 31:9	10:32:14 34:2	10:35:51 36:23
10:18:10 25:18	10:23:13 28:14	10:27:31 31:10	10:32:15 34:3	10:35:57 36:24
10:18:11 25:19	10:23:17 28:15	10:27:32 31:11	10:32:23 34:4,5	10:36:00 36:25 37:1
10:18:12 25:20,21	10:23:20 28:16	10:27:43 31:12	10:32:26 34:6	10:36:02 37:2
10:18:13 25:22	10:23:23 28:17	10:27:50 31:13	10:32:29 34:7	10:36:05 37:3
10:18:17 25:23	10:23:28 28:18	10:27:54 31:14	10:32:32 34:8	10:36:07 37:4
10:18:20 25:24	10:23:37 28:19	10:27:57 31:15	10:32:33 34:9	10:36:09 37:5
10:18:22 25:25	10:23:39 28:20	10:27:58 31:16	10:32:40 34:10	10:36:11 37:6
10:18:26 26:1	10:23:42 28:21	10:27:59 31:17	10:32:45 34:11	10:36:14 37:7
10:18:28 26:2	10:23:47 28:22	10:28:05 31:18,19	10:32:51 34:12	10:36:19 37:8
10:18:32 26:3	10:23:50 28:23	10:28:06 31:20	10:32:53 34:13	10:36:22 37:9,10
10:18:36 26:4	10:23:53 28:24	10:28:31 31:21	10:32:55 34:14	10:36:26 37:11
10:18:39 26:5	10:23:58 28:25	10:28:37 31:22	10:32:58 34:15	10:36:28 37:12
10:18:43 26:6	10:24:01 29:1	10:28:40 31:23	10:33:03 34:16	10:36:32 37:13
10:18:46 26:7	10:24:05 29:2	10:28:42 31:24	10:33:05 34:17	10:36:34 37:14
10:18:47 26:8	10:24:06 29:3	10:28:52 31:25	10:33:11 34:18	10:36:36 37:15
10:18:50 26:9	10:24:10 29:4	10:28:58 32:1	10:33:13 34:19	10:36:38 37:16
10:18:56 26:10	10:24:13 29:5	10:29:03 32:2	10:33:17 34:20	10:36:39 37:17
10:19:00 26:11	10:24:14 29:6	10:29:07 32:3	10:33:18 34:21	10:36:53 37:18
10:19:02 26:12	10:24:16 29:7	10:29:14 32:4	10:33:19 34:22	10:36:55 37:19
10:19:04 26:13	10:24:24 29:8	10:29:17 32:5	10:33:20 34:23	10:36:57 37:20
10:19:21 26:14	10:24:25 29:9,10	10:29:20 32:6	10:33:21 34:24	10:37:03 37:21
10:19:26 26:15,16	10:24:30 29:11	10:29:27 32:7	10:33:23 34:25	10:37:05 37:22
10:19:30 26:17	10:24:34 29:12	10:29:29 32:8	10:33:25 35:1	10:37:09 37:23
10:19:33 26:18	10:24:36 29:13	10:29:30 32:9	10:33:27 35:2,3,4	10:37:50 37:24
10:19:37 26:19	10:24:40 29:14	10:29:36 32:10	10:33:33 35:5	10:37:56 37:25
10:19:39 26:20	10:24:42 29:15	10:29:40 32:11	10:33:39 35:6	10:37:59 38:1
10:19:42 26:21	10:24:47 29:16	10:29:44 32:12	10:33:40 35:7	10:38:04 38:2
10:19:45 26:22,23	10:24:49 29:17	10:29:49 32:13	10:33:42 35:8	10:38:05 38:3
10:19:47 26:24	10:24:52 29:18	10:29:53 32:14	10:33:44 35:9	10:38:12 38:4
10:20:52 26:25	10:24:55 29:19	10:29:57 32:15	10:33:45 35:10	10:38:16 38:5
10:20:56 27:1	10:24:57 29:20,21	10:30:01 32:16	10:33:47 35:11	10:38:19 38:6
10:21:01 27:2	10:25:00 29:22	10:30:03 32:17	10:33:50 35:12	10:38:21 38:7
10:21:05 27:3	10:25:02 29:23	10:30:08 32:18	10:33:53 35:13	10:38:24 38:8
10:21:09 27:4	10:25:04 29:24	10:30:12 32:19	10:33:55 35:14	10:38:33 38:9
10:21:11 27:5	10:25:06 29:25	10:30:13 32:20	10:34:06 35:15	10:38:36 38:10
10:21:14 27:6	10:25:11 30:1	10:30:15 32:21	10:34:09 35:16	10:38:42 38:11
10:21:15 27:7	10:25:14 30:2,3	10:30:17 32:22	10:34:11 35:17	10:38:58 38:12
10:21:16 27:8	10:25:22 30:4	10:30:21 32:23	10:34:13 35:18	10:39:08 38:13
10:21:18 27:9	10:25:27 30:5	10:30:24 32:24	10:34:16 35:19	10:39:14 38:14
10:21:20 27:10	10:25:33 30:6	10:30:29 32:25	10:34:23 35:20	10:39:18 38:15
10:22:04 27:11	10:25:34 30:7	10:30:31 33:1	10:34:26 35:21	10:39:24 38:16
10:22:05 27:12	10:25:36 30:8	10:30:34 33:2	10:34:34 35:22	10:39:27 38:17
10:22:07 27:13	10:25:38 30:9	10:30:37 33:3,4	10:34:40 35:23	10:39:33 38:18
10:22:09 27:14	10:25:40 30:10	10:30:38 33:5	10:34:42 35:24	10:39:36 38:19
10:22:14 27:15	10:25:44 30:11	10:30:41 33:6	10:34:45 35:25	10:39:39 38:20,21,22
10:22:16 27:16	10:25:47 30:12	10:30:44 33:7	10:34:51 36:1	10:39:43 38:23
10:22:17 27:17,18	10:25:52 30:13	10:30:45 33:8	10:35:00 36:2	10:39:48 38:24
10:22:19 27:19	10:25:59 30:14	10:30:59 33:9	10:35:02 36:3	10:39:53 38:25 39:1
10:22:22 27:20	10:26:01 30:15	10:31:02 33:10	10:35:10 36:4	10:39:58 39:2
10:22:26 27:21	10:26:04 30:16	10:31:06 33:11	10:35:11 36:5	10:40:02 39:3
10:22:30 27:22	10:26:06 30:17	10:31:12 33:12	10:35:13 36:6	10:40:06 39:4
10:22:31 27:23	10:26:10 30:18	10:31:16 33:13	10:35:16 36:7	10:40:09 39:5
10:22:34 27:24	10:26:13 30:19	10:31:18 33:14	10:35:19 36:8,9	10:40:15 39:6
10:22:37 27:25 28:1	10:26:15 30:20,21	10:31:20 33:15	10:35:23 36:10	10:40:25 39:7
10:22:40 28:2	10:26:16 30:22	10:31:21 33:16	10:35:24 36:11	10:40:27 39:8
10:22:43 28:3	10:26:21 30:23	10:31:29 33:17	10:35:27 36:12	10:40:28 39:9
10:22:46 28:4	10:26:23 30:24	10:31:31 33:18	10:35:29 36:13	10:40:29 39:10
10:22:48 28:5	10:26:26 30:25	10:31:36 33:19	10:35:30 36:14	10:40:31 39:11
10:22:51 28:6	10:26:27 31:1	10:31:40 33:20	10:35:32 36:15,16	10:40:34 39:12,13
10:22:53 28:7	10:26:32 31:2	10:31:46 33:21	10:35:34 36:17	10:40:37 39:14
10:22:55 28:8	10:26:35 31:3	10:31:50 33:22	10:35:39 36:18	10:40:40 39:15
10:22:57 28:9	10:26:38 31:4	10:31:52 33:23	10:35:41 36:19	10:40:41 39:16
10:22:58 28:10	10:26:41 31:5	10:31:59 33:24	10:35:43 36:20	10:40:44 39:17
10:23:02 28:11	10:26:42 31:6,7	10:32:01 33:25	10:35:46 36:21	10:40:49 39:18
10:23:05 28:12	10:27:23 31:8	10:32:07 34:1	10:35:49 36:22	10:41:33 39:19

10:41:36 39:20	10:47:04 42:17	10:52:01 45:11	10:55:52 48:5	11:14:31 50:18
10:41:42 39:21	10:47:08 42:18	10:52:04 45:12,13	10:55:54 48:6	11:14:36 50:19
10:41:45 39:22	10:47:12 42:19	10:52:08 45:14	10:55:58 48:7	11:14:41 50:20
10:41:49 39:23,24	10:47:17 42:20	10:52:13 45:15	10:56:03 48:8,9	11:14:45 50:21
10:41:51 39:25	10:47:22 42:21	10:52:17 45:16	10:56:04 48:10	11:14:48 50:22
10:42:01 40:1	10:47:26 42:22	10:52:20 45:17	10:56:07 48:11	11:14:51 50:23
10:42:04 40:2	10:47:45 42:23	10:52:24 45:18	10:56:08 48:12	11:14:56 50:24
10:42:10 40:3	10:47:55 42:24	10:52:30 45:19	10:56:10 48:13,14	11:14:58 50:25
10:42:14 40:4,5	10:47:59 42:25	10:52:32 45:20	10:56:12 48:15	11:15:02 51:1
10:42:19 40:6	10:48:04 43:1	10:52:33 45:21	10:56:13 48:16	11:15:04 51:2
10:42:21 40:7	10:48:07 43:2	10:52:34 45:22	10:56:16 48:17	11:15:09 51:3
10:42:25 40:8	10:48:14 43:3	10:52:35 45:23	10:56:21 48:18	11:15:12 51:4
10:42:26 40:9,10	10:48:16 43:4	10:52:40 45:24	10:56:24 48:19	11:15:15 51:5
10:43:06 40:11	10:48:17 43:5	10:52:46 45:25	10:56:31 48:20	11:15:19 51:6
10:43:09 40:12	10:48:21 43:6	10:52:48 46:1	10:56:36 48:21	11:15:22 51:7
10:43:10 40:13	10:48:26 43:7	10:52:51 46:2	10:56:40 48:22	11:15:25 51:8
10:43:12 40:14	10:48:31 43:8	10:52:55 46:3	10:56:44 48:23	11:15:27 51:9
10:43:25 40:15	10:48:33 43:9	10:53:01 46:4	10:56:47 48:24	11:15:28 51:10
10:43:27 40:16	10:48:35 43:10	10:53:03 46:5	10:56:49 48:25	11:15:34 51:11
10:43:34 40:17	10:48:38 43:11	10:53:07 46:6	10:56:53 49:1	11:15:36 51:12
10:43:37 40:18	10:48:42 43:12	10:53:09 46:7,8	10:56:58 49:2	11:15:38 51:13
10:43:39 40:19	10:48:50 43:13	10:53:11 46:9	10:57:03 49:3	11:15:42 51:14
10:43:45 40:20	10:48:56 43:14	10:53:14 46:10	10:57:06 49:4	11:15:45 51:15
10:43:49 40:21	10:48:59 43:15	10:53:19 46:11	10:57:08 49:5	11:15:50 51:16
10:43:52 40:22	10:49:02 43:16	10:53:21 46:12,13	10:57:10 49:6	11:15:56 51:17
10:43:56 40:23,24	10:49:04 43:17	10:53:23 46:14	10:57:14 49:7	11:16:00 51:18
10:44:01 40:25	10:49:07 43:18	10:53:29 46:15	10:57:21 49:8	11:16:03 51:19
10:44:03 41:1	10:49:09 43:19	10:53:32 46:16	10:57:24 49:9	11:16:07 51:20
10:44:06 41:2	10:49:13 43:20	10:53:35 46:17	10:57:27 49:10	11:16:11 51:21
10:44:08 41:3	10:49:17 43:21	10:53:38 46:18	10:57:28 49:11	11:16:16 51:22
10:44:09 41:4,5	10:49:20 43:22	10:53:44 46:19	10:57:33 49:12	11:16:18 51:23
10:44:10 41:6	10:49:24 43:23	10:53:47 46:20	10:57:37 49:13	11:16:20 51:24
10:44:11 41:7	10:49:28 43:24	10:53:49 46:21	10:57:46 49:14	11:16:22 51:25
10:44:13 41:8	10:49:30 43:25	10:53:52 46:22	10:57:48 49:15,16	11:16:25 52:1
10:44:14 41:9	10:49:33 44:1,2	10:53:56 46:23	10:57:50 49:17	11:16:29 52:2
10:44:15 41:10	10:49:35 44:3	10:53:58 46:24	1000 27:1,2,4 32:23	11:16:32 52:3
10:44:16 41:11	10:49:38 44:4	10:54:00 46:25	38:2,11 39:5 40:20	11:16:36 52:4
10:44:20 41:12	10:49:43 44:5	10:54:04 47:1	42:25	11:16:41 52:5
10:44:25 41:13	10:49:47 44:6	10:54:08 47:2	1002 39:25 58:9	11:16:45 52:6
10:44:27 41:14	10:49:52 44:7	10:54:18 47:3	1037 39:19	11:16:50 52:7
10:44:36 41:15	10:49:55 44:8,9	10:54:21 47:4	11:12 49:19	11:16:52 52:8
10:44:40 41:16	10:49:57 44:10,11	10:54:27 47:5	11:12:53 49:18	11:16:56 52:9
10:44:43 41:17	10:50:01 44:12	10:54:30 47:6	11:12:55 49:19	11:16:58 52:10
10:44:49 41:18	10:50:05 44:13	10:54:39 47:7	11:12:57 49:20	11:17:01 52:11
10:44:50 41:19	10:50:08 44:14	10:54:43 47:8	11:12:58 49:21	11:17:02 52:12
10:44:53 41:20	10:50:17 44:15	10:54:48 47:9	11:13:00 49:22	11:17:05 52:13,14
10:45:01 41:21	10:50:19 44:16	10:54:51 47:10	11:13:06 49:23	11:17:08 52:15
10:45:03 41:22	10:50:22 44:17	10:54:52 47:11	11:13:09 49:24	11:17:17 52:16
10:45:06 41:23	10:50:24 44:18	10:54:54 47:12	11:13:11 49:25	11:17:18 52:17
10:45:11 41:24	10:50:25 44:19	10:54:55 47:13	11:13:18 50:1	11:17:21 52:18
10:45:15 41:25	10:50:45 44:20	10:55:00 47:14	11:13:23 50:2	11:17:25 52:19
10:45:21 42:1	10:50:50 44:21	10:55:02 47:15	11:13:27 50:3	11:17:30 52:20
10:45:25 42:2	10:50:54 44:22	10:55:06 47:16	11:13:29 50:4	11:17:31 52:21
10:45:29 42:3	10:50:59 44:23	10:55:11 47:17	11:13:36 50:5	11:17:32 52:22
10:45:32 42:4	10:51:00 44:24	10:55:15 47:18	11:13:42 50:6	11:17:34 52:23
10:45:35 42:5	10:51:13 44:25	10:55:19 47:19	11:13:45 50:7	11:17:39 52:24
10:45:36 42:6	10:51:17 45:1	10:55:22 47:20	11:13:50 50:8	11:17:51 52:25
10:46:30 42:7	10:51:20 45:2	10:55:29 47:21	11:13:54 50:9	11:17:57 53:1
10:46:32 42:8	10:51:28 45:3	10:55:31 47:22	11:13:59 50:10	11:18:00 53:2
10:46:37 42:9	10:51:33 45:4	10:55:32 47:23	11:14:03 50:11	11:18:04 53:3
10:46:40 42:10	10:51:38 45:5	10:55:34 47:24	11:14:08 50:12	11:18:06 53:4
10:46:41 42:11	10:51:46 45:6	10:55:37 47:25	11:14:12 50:13	11:18:09 53:5
10:46:47 42:12	10:51:50 45:7	10:55:39 48:1	11:14:15 50:14	11:18:13 53:6
10:46:51 42:13	10:51:51 45:8	10:55:42 48:2	11:14:18 50:15	11:18:17 53:7,8
10:46:53 42:14	10:51:52 45:9	10:55:47 48:3	11:14:20 50:16	11:18:18 53:9
10:46:56 42:15,16	10:51:59 45:10	10:55:49 48:4	11:14:25 50:17	11:18:21 53:10

11:18:23 53:11	11:22:08 56:3	11:26:48 58:21	<u>2</u>
11:18:26 53:12	11:22:11 56:4	11:26:52 58:22	20th 44:16
11:18:28 53:13	11:22:15 56:5	11:26:55 58:23	2002 1:24 2:6 5:7 61:18
11:18:29 53:14	11:22:24 56:6	11:26:57 58:24	2003 60:9
11:18:31 53:15	11:22:30 56:7	11:26:59 58:25	206 6:19
11:18:34 53:16	11:22:34 56:8	11:27:03 59:1	24 10:15
11:18:36 53:17	11:22:38 56:9	11:27:05 59:2	25 1:24
11:18:38 53:18	11:22:41 56:10	11:30:39 59:3	25th 2:6 5:7
11:18:39 53:19	11:22:45 56:11	11:30:48 59:4	29th 61:18
11:18:44 53:20	11:22:48 56:12	11:30:50 59:5	<u>3</u>
11:18:55 53:21	11:22:52 56:13	11:30:51 59:6	3 40:3,5
11:18:57 53:22	11:22:56 56:14	11:30:52 59:7	<u>5</u>
11:18:58 53:23	11:22:59 56:15,16	11:30:54 59:8	5 16:2,24
11:19:04 53:24	11:23:03 56:17	11:30:57 59:9	<u>6</u>
11:19:06 53:25	11:23:05 56:18	11:31:00 59:10	6 4:3 16:2,24 31:23
11:19:11 54:1	11:23:07 56:19	11:31:04 59:11	60 61:13
11:19:15 54:2	11:23:09 56:20	11:31:07 59:12	6197 39:11
11:19:20 54:3	11:23:13 56:21	11:31:09 59:13	<u>9</u>
11:19:24 54:4	11:23:19 56:22	11:31:13 59:14	9:50 2:9 5:8
11:19:27 54:5	11:23:23 56:23	11:31:16 59:15	90 44:14
11:19:28 54:6	11:23:27 56:24	11:31:19 59:16	95-0315 61:24
11:19:35 54:7	11:23:31 56:25	11:31:22 59:17	97 44:17
11:19:38 54:8	11:23:34 57:1	11:31:24 59:18	
11:19:42 54:9	11:23:37 57:2	11:31:26 59:19	
11:19:44 54:10	11:23:40 57:3	11:31:28 59:20	
11:19:52 54:11	11:23:48 57:4	11:31:31 59:21,22	
11:19:54 54:12	11:23:49 57:5	11:31:32 59:23	
11:19:57 54:13	11:23:50 57:6	11:31:35 59:24	
11:20:01 54:14	11:23:51 57:7	11:31:37 59:25	
11:20:04 54:15	11:23:54 57:8	11:31:38 60:1	
11:20:07 54:16	11:23:56 57:9	11:31:41 60:2	
11:20:10 54:17	11:24:12 57:10	11:31:44 60:3	
11:20:13 54:18	11:24:19 57:11	11:31:46 60:4	
11:20:17 54:19	11:24:25 57:12	11:31:48 60:5,6	
11:20:24 54:20,21	11:24:33 57:13	11:31:50 60:7	
11:20:26 54:22	11:24:34 57:14	11:31:52 60:8	
11:20:29 54:23	11:24:43 57:15	11:31:55 60:9	
11:20:30 54:24	11:24:49 57:16	11:31:59 60:10	
11:20:32 54:25	11:24:52 57:17	11:32 60:17	
11:20:34 55:1	11:24:56 57:18	11:32:01 60:11	
11:20:38 55:2	11:25:00 57:19	11:32:03 60:12	
11:20:41 55:3	11:25:04 57:20	11:32:06 60:13	
11:20:43 55:4	11:25:07 57:21	11:32:08 60:14	
11:20:45 55:5	11:25:11 57:22	11:32:12 60:15	
11:20:48 55:6	11:25:14 57:23	11:32:13 60:16	
11:20:52 55:7	11:25:17 57:24,25	1211 2:7 5:13	
11:20:58 55:8	11:25:29 58:1	1500 2:8	
11:21:01 55:9	11:25:33 58:2	16830 5:10	
11:21:06 55:10	11:25:37 58:3	18-month 10:21	
11:21:09 55:11	11:25:48 58:4	181 39:13 40:18,22	
11:21:14 55:12	11:25:49 58:5	41:17,23 43:1 58:11	
11:21:17 55:13	11:25:51 58:6	19 9:23	
11:21:25 55:14	11:25:54 58:7	1977 9:16	
11:21:27 55:15	11:25:56 58:8	1978 9:23	
11:21:31 55:16	11:26:01 58:9	1984 7:21 10:1	
11:21:33 55:17	11:26:08 58:10	1986 10:8	
11:21:34 55:18	11:26:11 58:11	1989 7:23 10:8,9	
11:21:37 55:19	11:26:14 58:12	1995-1996 23:17	
11:21:44 55:20	11:26:17 58:13	1996 10:23,24 11:4,7,8	
11:21:46 55:21	11:26:19 58:14	11:9 13:8	
11:21:49 55:22	11:26:20 58:15	1997 15:17 16:3 28:25	
11:21:51 55:23	11:26:22 58:16	34:3 42:24 43:7	
11:21:55 55:24	11:26:23 58:17	52:13,16	
11:21:57 55:25	11:26:40 58:18	1998 44:16	
11:22:00 56:1	11:26:44 58:19	1999 11:1,24	
11:22:05 56:2	11:26:46 58:20		



## Videotaped Deposition of Thomas Taylor, Vol. II - October 23, 2002

\*\*\* HIGHLY CONFIDENTIAL \*\*\*

Page 62

1 IN THE UNITED STATES DISTRICT COURT  
2 FOR THE DISTRICT OF OREGON  
3 SEMITOOL, INC.,  
4 Plaintiff,  
5 vs. No. 16-01-06060  
6 NOVELLUS SYSTEMS, INC.,  
7 Defendant.  
8 HIGHLY CONFIDENTIAL  
9 VIDEOTAPED DEPOSITION OF  
10 THOMAS TAYLOR  
11 VOLUME II  
12 October 23, 2002  
13 9:15 a.m.  
14 6011 SW Second Avenue  
15 Suite 1600  
16 Portland, Oregon  
17 Carol Ann Nevarez, Certified Shorthand Reporter for Oregon  
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Page 64

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Page 63

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16 Calispell, Montana 59901  
17  
18 Counsel for the Defendant, Novellus:  
19 ROMAN MELNIK, Esquire  
20 Irell & Manella LLP  
21 1800 Avenue of the Stars  
22 Suite 900  
23 Los Angeles, CA 90067  
24 (310) 227-1010  
25 -and-

Page 65

1 Deposition of Thomas Taylor, Volume II  
2 October 23, 2002  
3 THOMAS TAYLOR, having been first  
4 duly sworn on oath by the Certified Shorthand  
5 Reporter to tell the truth, the whole truth,  
6 and nothing but the truth, was examined and  
7 testified as follows:  
8 EXAMINATION  
9 BY-MR. RIEDINGER:  
10 Q. Thank you, Mr. Taylor and thank  
11 you for coming back for another session. We  
12 appreciate it.  
13 What I would like to do today is,  
14 go over some documents that describe activity  
15 that you were involved with when you were at  
16 Semitool, activity principally in 1997, but  
17 starting in the end of 1996.  
18 I would like to say that several  
19 of the documents that we're going over came  
20 from this book. I don't know whether it's a  
21 book that you were familiar with when you  
22 were at Semitool, but it is a chronological  
23 file of some of the ATG group meetings, and  
24 if you would like to look at the originals,  
25 several of them are in here. And perhaps,

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Page 66

1 you would find them useful.  
 2 Before we start going over that  
 3 activity, I would just like to bring your  
 4 foundation up-to-date. Are you currently  
 5 employed by Applied Materials?  
 6 A. Yes, I am.  
 7 Q. What is your position?  
 8 A. My position is Director of Product  
 9 Technology. I'm specifically focusing on  
 10 electrochemical deposition technologies and  
 11 programs between Applied Materials and Intel.  
 12 Q. And when did you begin your  
 13 employment with Applied?  
 14 A. April of this year.  
 15 Q. Do you have a specific date?  
 16 A. April 1st.  
 17 Q. Hopefully, that's not significant.  
 18 April Fools Day.  
 19 A. There were a few comments made  
 20 along those lines.  
 21 Q. All right. I would like to begin  
 22 with a document that is one of the two  
 23 documents that we sent to you gentlemen  
 24 yesterday, and the court reporter has  
 25 premarked as Exhibit-50, the document bearing

Page 68

1 because you have a great chorus on this side  
 2 because I have to articulate objections  
 3 separately, so there will be a cascade down  
 4 the table.  
 5 BY MR. RIEDINGER:  
 6 Q. Mr. Taylor, does your signature  
 7 appear on the second page?  
 8 A. Yes, it does.  
 9 Q. And is that a date next to your  
 10 signature?  
 11 A. Yes, it is.  
 12 Q. Is that date in your handwriting?  
 13 A. Yes, it is.  
 14 Q. Does that indicate that Exhibit 50  
 15 was prepared on or about the 24th of October  
 16 of 1996?  
 17 A. Yes, it does.  
 18 Q. What was your position at Semitool  
 19 in October of 1996?  
 20 A. The actual job title, I don't  
 21 recall clearly, but in effect, it was the  
 22 Manager of Process Development.  
 23 Q. Was Exhibit 50 prepared as part of  
 24 your work as the Manager of Process  
 25 Development?

Page 67

1 Semitool production numbers ST021359 through  
 2 362. And I place that before you, Mr.  
 3 Taylor. Do you recognize Exhibit 50?  
 4 A. If you will give me just a moment.  
 5 Q. Sure.  
 6 A. I recognize the latter pages, and  
 7 I know that I wrote the first ones -- at  
 8 least, it's clear that I did, but I don't  
 9 remember having written it specifically. But  
 10 I do remember, in fact, producing the -- the  
 11 matrixes that are listed at the end.  
 12 Q. The final two pages --  
 13 A. Yes.  
 14 Q. -- having tables?  
 15 A. Yes.  
 16 Q. -- of numbers or --  
 17 A. Conditions.  
 18 Q. -- conditions?  
 19 MR. BROWN: One thing, just so you  
 20 know, because the court reporter is taking  
 21 down what you say, you need to try to let  
 22 him finish his question before you answer.  
 23 Often, that's hard, but let him articulate a  
 24 complete question and then answer.  
 25 MR. MELNIK: And particularly,

Page 69

1 A. Yes.  
 2 Q. The subject of Exhibit 50 is  
 3 Plating Process Characterization Experiments.  
 4 What, if anything, does that mean to you?  
 5 A. I'm not exactly sure how to answer  
 6 the question because, in effect, that's  
 7 exactly what it means is the recommendation  
 8 for experiments to be conducted to  
 9 characterize plating process capabilities.  
 10 Q. Was Exhibit 50 a recommendation by  
 11 you that such characterization experiments be  
 12 conducted?  
 13 A. Yes.  
 14 Q. If I look at the very first  
 15 paragraph on the first page of Exhibit 50, it  
 16 refers to recommendations for the first two  
 17 of a series of experiments intended to lead  
 18 to complete characterization, et cetera.  
 19 Why were you recommending  
 20 experiments at the time?  
 21 A. I do not remember exactly what was  
 22 my motivation at the time. However, my  
 23 recollection -- partial recollection is that I  
 24 was unsatisfied with the depth of  
 25 understanding that we had on the impact of

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Page 74

1 A. These tables identify what was --  
2 which was characterized on the first page as  
3 fractional factorial experiments intended to be  
4 as efficient as possible in the number of  
5 experimental runs conducted to characterize the  
6 results of parameters such as, electrolyte  
7 flow, wafer rotation speed, separation between  
8 the wafer and the immersed anode and the  
9 separation between the anode and an immersed  
10 diffuser on plated film uniformity.

11 Q. Did either -- I'm sorry -- were  
12 you finished?

13 A. Yes, I am finished.

14 Q. Did either of experiments one or  
15 two of the last two pages of Exhibit 50, did  
16 they involve seed layers?

17 A. Involve seed layers insofar as the  
18 wafers that were plated required a seed layer  
19 for the plating process to be conducted.

20 Q. Did the experiments involve  
21 characterizing the seed layers or seed layer  
22 capabilities in any way?

23 MR. BROWN: Vague.

24 MR. MELNIK: Join.

25 THE WITNESS: I'm sorry. I don't

Page 76

1 A. I do not recall whether this was  
2 contemporaneous or preceded the work on seed  
3 layers.

4 Q. Okay. Go to the next document.

5 MR. RIEDINGER: Would you mark  
6 this as the next exhibit, please?

7 THE REPORTER: Would you try to  
8 slow down, please?

9 THE WITNESS: Yes, I will.

10 MR. BROWN: Particularly when you  
11 are reading. People have a natural tendency  
12 to read things faster than you would say  
13 them.

14 (The document referred to was  
15 marked Taylor Exhibit-51 for identification.)

16 BY MR. RIEDINGER:

17 Q. Mr. Taylor, the court reporter has  
18 marked as Exhibit 51, a three-page document  
19 having production numbers 009915 through 17,  
20 and that's now before you. Do you recognize  
21 Exhibit 51?

22 A. No, I do not.

23 Q. How about the first page, which  
24 appears to me to be some kind of organization  
25 chart for the Advanced Technology Group at

Page 75

1 recall. I would like to point out, though,  
2 that nothing in this document that seems to  
3 indicate that there was a characterization of  
4 seed layers, per se, in fact, very  
5 explicitly, we had initially concentrated on  
6 optimizing the process for thickness uniformity  
7 of the plated films.

8 THE REPORTER: Would you slow  
9 down? Optimizing?

10 THE WITNESS: Yes. It says  
11 explicitly, initially concentrate on optimizing  
12 the processes for thickness uniformity of the  
13 plated films, and secondarily, for maximum  
14 plating rate.

15 BY MR. RIEDINGER:

16 Q. So, did work on seed layers arise  
17 later --

18 MR. BROWN: Vague.

19 BY MR. RIEDINGER:

20 Q. -- as part of the characterization  
21 experiments?

22 MR. BROWN: Vague.

23 MR. MELNIK: Joined.

24 BY MR. RIEDINGER:

25 Q. You may answer.

Page 77

1 Semitool. Do you recognize that?

2 A. I do not.

3 Q. Have you -- do you recall seeing  
4 organization charts of this kind when you  
5 were at Semitool?

6 A. I do not.

7 Q. There is a date in the lower right  
8 corner, April 9, 1997. And I see your name  
9 in a circle with the word "seed layer" above  
10 it. Do you see that?

11 A. Yes, I do.

12 Q. In April of 1997, did you have  
13 responsibilities within the Advanced Technology  
14 Group relating to seed layers?

15 A. Yes, I did, but not exclusively  
16 related to seed layers.

17 Q. Okay. What aspect or portion of  
18 your responsibilities in 1997 -- April of '97  
19 at Semitool related to seed layers?

20 A. This organization chart notes that  
21 ECD has a name of Chris Haugan; underneath  
22 it, Tom Ritzdorf and Dr. Chen. It also has  
23 bubbles on field and external field issues,  
24 Bob Batz and Lab Manager, Customer Demo Jeff  
25 Turner.

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Page 70

1 important -- or what I considered to be  
2 critical process parameters on the final  
3 plating process result and that we  
4 insufficiently understood the responses to  
5 these various input parameters such as flow,  
6 rotation, anode/cathode separation, and  
7 anode/diffuser separation.

8 Q. When did you decide to make the  
9 recommendation that's in Exhibit 50?

10 A. The only date that I can refer you  
11 to is the date that this was issued, October  
12 24.

13 Q. And, in fact, were a series of  
14 experiments conducted to lead to  
15 characterization and optimization of, among  
16 other things, copper electroplating processes?

17 A. There were certainly a series of  
18 experiments run during the period of time  
19 that I was run at Semitool. I do not recall  
20 the exact results of this particular  
21 recommendation, but there were a series over  
22 the course of the two-plus years that I was  
23 there that examined these parameters and the  
24 results on the plated film.

25 Q. Did you subsequently have any role

Page 72

1 Q. What companies were those?

2 A. Comprehensive list, I don't recall,  
3 but they certainly involved Intel, AMD,  
4 Motorola. We performed experiments for  
5 Fujitsu. We performed experiments for NEC,  
6 and those are the only ones that I have  
7 immediate recollection of.

8 Q. Did you have any role in dealing  
9 with or interacting with people at those  
10 other companies: Intel, AMD, Motorola, Fujitsu,  
11 NEC?

12 A. Yes.

13 Q. And what was your role?

14 A. My role was in working with them  
15 to identify what their success criteria were,  
16 what problems that they were currently  
17 experiencing, what they considered to be their  
18 desired outcome of experimentation, logistics  
19 on availability of substrates, details of how  
20 those substrates were manufactured prior to  
21 processing at Semitool, details of the  
22 experimentation to be conducted at Semitool,  
23 analysis of the results of that  
24 experimentation.

25 Q. Would you say that you were the

Page 71

1 in the conduct of experiments to characterize  
2 copper electroplating -- electroplating  
3 processes at Semitool?

4 A. Absolutely, yes.

5 Q. What was that role?

6 A. The role was in -- as suggested by  
7 this document in designing these experiments,  
8 and then subsequently analyzing them,  
9 discussing with the engineers the impediments  
10 that they might have encountered in conducting  
11 them, helping to allocate resources, resolve  
12 priorities --

13 Q. Okay.

14 A. -- functioning as the Manager of  
15 Process Development.

16 Q. Did any of those characterization  
17 experiments relate to seed layers -- copper  
18 seed layers?

19 A. Some of those experiments related  
20 to attempting to produce the best possible  
21 fill on a variety of seed layers, yes.

22 Q. And did the characterization  
23 experiments involve work with other companies  
24 -- companies other than Semitool?

25 A. Yes.

Page 73

1 principal point of contact with each of those  
2 companies for those characterization  
3 experiments?

4 A. Not -- that would be too broad of  
5 a statement. I was one of the points of  
6 contact.

7 Q. Were you one of the main points of  
8 contacts?

9 A. Yes.

10 Q. Who else would you say, if anyone,  
11 was a main point of contact?

12 MR. BROWN: It's vague as to time.

13 BY MR. RIEDINGER:

14 Q. For the characterization  
15 experiments.

16 A. Certainly, Tom Ritzdorf was one of  
17 the principal points of contact.  
18 Occasionally, individuals such as Bob Batz or  
19 Jeff Turner would have a lead role in direct  
20 interfacing with the customers, particularly  
21 when discussing logistics and availability of  
22 substrates, et cetera, timing of experiments.

23 Q. And could you briefly tell me what  
24 is shown in a general fashion on the last  
25 two pages of Exhibit 50?

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Page 82

1 exhibit?  
 2 (The document referred to was  
 3 marked Taylor Exhibit-52 for identification.)  
 4 THE WITNESS: Thank you.  
 5 BY MR. RIEDINGER:  
 6 Q. Now, Mr. Taylor, the court reporter  
 7 has marked as Exhibit 52 a one-page document  
 8 having production numbers 001833, and that's  
 9 before you. Do you recognize Exhibit 52?  
 10 A. No, I don't.  
 11 Q. The subject of Exhibit 52 is a  
 12 meeting -- Intel meeting Monday, April 28th.  
 13 Do you have a recollection of a meeting with  
 14 Intel at the end of April 1997?  
 15 A. I do not have a recollection of  
 16 meeting with Intel specifically at the end of  
 17 April of 1997.  
 18 Q. If you look at the box that  
 19 appears in the middle of the page of Exhibit  
 20 52, there is a reference to San Jose, Bob  
 21 Berner, Tom Taylor, Chris Haugan and --  
 22 excuse me -- Tom Taylor, Chris Haugan and  
 23 Jeff Turner. Then, it has times to depart  
 24 Kalispell and a time for departing San Jose.  
 25 Do you have a recollection of the

Page 84

1 Q. And the reason I asked that is  
 2 that Exhibit 52 in the paragraph under the  
 3 word "Chris" is suggesting that Mr. Haugan  
 4 should bring foils on the material he's been  
 5 working on.  
 6 Does that refresh your recollection  
 7 that perhaps some foils were brought down to  
 8 Intel and presented?  
 9 A. I don't remember.  
 10 Q. Do you have a recollection of Mr.  
 11 Haugan doing any work as part of  
 12 characterization experiments in April of 1997?  
 13 A. I do not.  
 14 Q. Do you have any idea whether Mr.  
 15 Haugan may have presented information regarding  
 16 characterization work to Intel at any time,  
 17 April or otherwise, within 1997?  
 18 A. My recollection is obviously not  
 19 specific. I do recall that we had the  
 20 discussion with Intel on modeling and on  
 21 possible applications to reactor design. I  
 22 do not recall whether Chris Haugan actually  
 23 made that presentation.  
 24 Q. Do you recall making presentations  
 25 to Intel at any time -- you personally making

Page 83

1 four of you at any time going down to San  
 2 Jose for a meeting with Intel?  
 3 A. Yes.  
 4 Q. What is your recollection?  
 5 A. My recollection is that we had a  
 6 discussion with Intel on the potential for  
 7 engaging Intel's capability in modeling for  
 8 possible application in reactor design.  
 9 Q. And what do you mean by modeling?  
 10 A. Modeling such as computational  
 11 fluid dynamics or the computational methods to  
 12 determine the distribution of electric field  
 13 flux within a reactor containing conductive  
 14 electrolyte.  
 15 Q. Okay.  
 16 A. They had -- please excuse me.  
 17 They had experience in modeling low pressure  
 18 reactors and were interested in determining  
 19 whether their expertise could be generalized  
 20 to something like a plating.  
 21 Q. Who did you meet with at Intel?  
 22 A. I don't recall.  
 23 Q. Do you recall bringing any  
 24 materials with you to present to Intel?  
 25 A. No, I don't.

Page 85

1 presentations to Intel at any time in the  
 2 first half of 1997?  
 3 A. I remember detailed technical  
 4 discussions. I do not recall presentation  
 5 format, but I do certainly recall discussions  
 6 in which Intel and Semitool engineers had  
 7 cross the table working discussions that I  
 8 was involved in.  
 9 Q. Who were the Intel people who were  
 10 involved --  
 11 A. The individuals that I've noted in  
 12 my previous deposition and were Chun Mu and a  
 13 gentleman named Shu Jin.  
 14 Q. Did your discussions with Mr. Mu  
 15 and Mr. Jin involve characterization  
 16 experiments?  
 17 A. Could you clarify that, please?  
 18 What do you mean by characterization  
 19 experiments?  
 20 Q. Well, as that phrase is used in  
 21 Exhibit 50, did they involve the kinds of  
 22 characterization experiments that are described  
 23 in Exhibit 50?  
 24 A. Yes.  
 25 Q. And did they also involve

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Page 78

1 Both of those bubbles are connected  
2 to the one that includes my name. My scope  
3 of responsibilities included the ones that are  
4 identified under field or -- excuse me --  
5 process external field issues. The  
6 responsibilities noted under "Lab Manager DOE  
7 Customer Demos" but also included Core ECD  
8 Technology Development, which includes the  
9 bubble showing Tom Ritzdorf and Dr. Chen.

10 Q. There are several names that appear  
11 on the first page of Exhibit 51 aside from  
12 yours. Did any of the people listed on that  
13 page report directly to you in April of 1997?

14 A. Any of the people -- I was  
15 completing performance appraisals and directing  
16 the work of individuals that I have just  
17 noted, which involved Tom Ritzdorf, Dr. Chen,  
18 Bob Batz, Jeff Turner. There was -- there  
19 were a number of managerial changes that were  
20 taking place at Semitool during the period of  
21 time in which Advanced Technology Group was,  
22 in some cases, treated as a division, and in  
23 other cases, not. And the period of time in  
24 which this organizational chart is dated my  
25 recollection is that was one of the periods

Page 80

1 Q. Okay. So, why don't we talk about  
2 the period that's the first half of 1997 --  
3 beginning in 1997 through the end of June.

4 Either by reference to Exhibit 51  
5 or without referring to it, can you tell me  
6 who were the individuals within the Advanced  
7 Technology Group that you recall were involved  
8 in the seed layer work?

9 A. I'm sorry. I don't remember  
10 specific programs underway on seed layer at  
11 that time.

12 Q. Any time in the first six months  
13 -- first six months of 1997?

14 A. I don't recall any specific  
15 programs that were underway during that period  
16 of time.

17 Q. Okay. Well, perhaps we can  
18 refresh your recollection as we look at some  
19 more documents.

20 And by the way, this notebook is  
21 available for you to review at any time and  
22 it does have, I think, in reverse  
23 chronological order, a number of these same  
24 documents. Perhaps, the context might help  
25 you out. And if you feel the need to look

Page 79

1 in which the corporate structure was in flux.  
2 I do not recall ever having seen this sleet.

3 Q. Okay. Mr. Haugan -- Chris Haugan,  
4 was he a person who, in April of 1997 was at  
5 least to some extent, under your supervision?

6 A. I don't recall having directly  
7 supervised Chris Haugan.

8 Q. And I am not sure I understood one  
9 of your earlier answers. Aside from  
10 yourself, were there other people who are  
11 listed on the first page of Exhibit 51 who  
12 had some responsibility in the seed layer  
13 area within the Advanced Technology Group?

14 A. In that particular period of time,  
15 I don't recall who else might have had  
16 responsibility for seed layer. I don't even  
17 recall specifically whether there were any  
18 detailed engineering efforts being expended on  
19 seed layer.

20 I do know that at that period of  
21 time, we had identified the ability to do an  
22 electrolytic seed layer as being a desirable  
23 technical thrust, but whether there were any  
24 programs underway specifically at that time, I  
25 don't know.

Page 81

1 at it, feel free to do so.

2 A. That's a rather thick document.  
3 Would it be best for me to go off-line and  
4 read it prior to continuing this discussion?

5 Q. I don't think so. Only if there  
6 is a particular thing that you think that  
7 might -- your recollection might be refreshed  
8 by seeing a particular document, it might  
9 well be in there.

10 Most of these documents that we're  
11 going through today are in there. And if  
12 you want to see them in context, you are  
13 welcome to. I'm not asking you to read it.

14 MR. BROWN: I think I object to  
15 you suggesting that he should refresh his  
16 recollection before answering any question by  
17 going through this two-inch binder, but if  
18 you want to show him some particular  
19 documents, that's fine. If he needs to see  
20 context, and then you show him the binder  
21 that makes sense also.

22 MR. RIEDINGER: Of course, that  
23 was not my suggestion. I was merely saying  
24 it's available if he wants to.

25 Could we mark this as the next

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Page 90

1 the record that, while it does not bear the  
2 same Bates range, it appears to be the same  
3 memo that was previously marked as Exhibit  
4 1052.  
5 MR. MELNIK: During the Stevens  
6 deposition.  
7 THE WITNESS: Nothing substantive  
8 is inaccurate, only some of the somewhat  
9 whimsical comments about loving to be shown  
10 experimental observations that I can't explain,  
11 but nothing that's -- nothing that's  
12 substantial is inaccurate.  
13 BY MR. RIEDINGER:  
14 Q. Thank-you. Does -- would you call  
15 this a memo, Exhibit 53?  
16 A. I have no idea what the definition  
17 of "memo" is.  
18 Q. This is a document -- does Exhibit  
19 53 relate to the characterization experiments  
20 that are described in Exhibit 50?  
21 MR. BROWN: Vague.  
22 THE WITNESS: This is a  
23 communication between myself and Chun Mu  
24 describing a proposal to conduct certain  
25 experiments.

Page 92

1 A. -- to the May 1, 1997 document.  
2 I do not recall having referred explicitly  
3 back to any results that were obtained from  
4 October 24th, 1996 experimental plans.  
5 Q. Here is my question, and I'm  
6 probably expressing it very inartfully. It  
7 occurs to me that perhaps the series of  
8 experiments that are discussed in Exhibit 50  
9 over time resulted in more experiments,  
10 whether they specifically were referred to in  
11 one memo or another.  
12 So, is Exhibit 53 a continuation  
13 -- does it describe experiments that are a  
14 continuation of the experiments of Exhibit 50?  
15 MR. MELNIK: Objection, asked and  
16 answered.  
17 MR. BROWN: Vague.  
18 THE WITNESS: In some cases, the  
19 experiments identified in the May 1, 1997  
20 memo, Exhibit 53, refer to process parameters  
21 that are similar to those identified in the  
22 previous experiment. That doesn't imply that  
23 the results of the experiments described in  
24 Exhibit 50 were the predecessors of any  
25 experimental design described in experiment

Page 91

1 BY MR. RIEDINGER:  
2 Q. But what I'm trying to determine  
3 is if these experiments that are described in  
4 Exhibit 53 were parts of that characterization  
5 process that was described in the October 24,  
6 1996 memo to Tom Ritzdorf.  
7 MR. BROWN: It's vague and  
8 compound.  
9 MR. MELNIK: Join.  
10 THE WITNESS: This set of  
11 experiments is not connected in a direct way  
12 with the experiments that were suggested in  
13 October of 1996. This was a separate effort.  
14 BY MR. RIEDINGER:  
15 Q. Did the experiments that are  
16 described in Exhibit 53 evolve from what's  
17 described in Exhibit 50, the October 24th  
18 memo?  
19 MR. BROWN: Vague.  
20 THE WITNESS: Did it evolve from  
21 it? At the time that this proposal was  
22 made --  
23 BY MR. RIEDINGER:  
24 Q. You are referring now to Exhibit  
25 53?

Page 93

1 (sic) 53.  
2 The answer is, the best of my  
3 ability to do so, is no. The experiments  
4 described in Exhibit 53 were not made in  
5 reference or an extension of the experiments  
6 described in Exhibit 50.  
7 BY MR. RIEDINGER:  
8 Q. Part of the reason I'm asking that  
9 is because Exhibit 50 refers to Experiments 1  
10 and 2, and Exhibit 53 is Experiments 5 and  
11 6. And I wonder if they are 5 and 6 in the  
12 same series.  
13 A. No. In this case, Experiment 5  
14 and 6 referred to experiments that were  
15 conducted specifically with Intel's  
16 involvement.  
17 Q. Okay. So, is it correct to say  
18 that exhibit -- Experiments 5 and 6 as  
19 described in Exhibit 53 were 5 and 6 in the  
20 series of experiments with Intel?  
21 A. Yes, that is the best of my  
22 recollection.  
23 Q. Are Experiments 5 and 6 described  
24 in Exhibit 53 characterization experiments?  
25 MR. MELNIK: Vague.

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Page 86

1 characterization experiments relating to seed  
2 layers?  
3 A. They certainly involved  
4 characterization experiments on attempting to  
5 produce the best fill on Intel seed layers.  
6 Q. Okay. And what was your role in  
7 those characterization experiments that were  
8 attempting to produce the best fill on Intel  
9 wafers?  
10 A. My role was specifically in  
11 discussions with Chun Mu is attempting to  
12 identify what factors might influence the  
13 success of the fill. Also, emphasizing to  
14 Chun Mu that the seed layer was an important  
15 input to determining success.  
16 We had requested that Intel provide  
17 us with cross-sections of their seed layer  
18 prior to plating so that we could identify  
19 whether those seed layers were continuous,  
20 evaluating different plating parameters in an  
21 attempt to fill on their seed layers, and  
22 then ultimately, an attempt to do a -- an  
23 electroless process prior to electrolytic  
24 copper deposition.  
25 Q. What was the purpose of attempting

Page 88

1 what parameters could be pursued, discussing  
2 the viability of different approaches,  
3 designing the subsequent experiments,  
4 identifying the number of wafers required that  
5 Intel would have to provide.  
6 Q. Anything else that you can recall?  
7 A. Analyzing the results at the  
8 conclusion.  
9 Q. Let's go on to the next exhibit.  
10 MR. RIEDINGER: If you could mark  
11 this as the next one, please.  
12 (The document referred to was  
13 marked Taylor Exhibit-53 for identification.)  
14 MR. BROWN: 53.  
15 MR. RIEDINGER: Thank you.  
16 BY MR. RIEDINGER:  
17 Q. Mr. Taylor, the court reporter has  
18 marked as Exhibit 53, a four-page document  
19 having production numbers 003081 through 84,  
20 and that exhibit is now in front of you.  
21 Do you recognize Exhibit 53?  
22 A. Yes, I do.  
23 Q. Did you write Exhibit 53?  
24 A. Yes, I did.  
25 Q. What is Exhibit 53?

Page 87

1 to do an electroless -- electroless process  
2 before doing the electrolytic deposition?  
3 A. The attempt was to supplement the  
4 existing seed layer prior to electrolytic  
5 process in an attempt to eliminate some of  
6 the voiding that had been previously observed  
7 in earlier experiments.  
8 Q. Why were you doing that?  
9 A. For the reasons just stated: As  
10 an attempt to determine whether we could  
11 avoid some of the voiding that had been  
12 observed in previous experiments.  
13 Q. What was your personal role in the  
14 attempts to determine the -- let me step  
15 back.  
16 MR. RIEDINGER: Would you read his  
17 last answer back, please?  
18 (Record read.)  
19 MR. RIEDINGER: Thank you.  
20 BY MR. RIEDINGER:  
21 Q. So, what was your personal role in  
22 the attempt to determine whether one could  
23 avoid some of the voiding that had occurred  
24 in previous experiments?  
25 A. Working with Intel to conceptualize

Page 89

1 A. Exhibit 53 is entitled Experiment 5  
2 and 6 Proposals. This is a communication  
3 between myself and Chun Mu of Intel.  
4 Q. Is that your signature that appears  
5 on the first page of Exhibit 53?  
6 A. Yes, it is.  
7 Q. Did you write all of Exhibit 53?  
8 A. Yes, I did.  
9 Q. When was the last time that you  
10 recall seeing Exhibit 53?  
11 A. Prior to the last deposition.  
12 Q. You reviewed materials in advance  
13 of the last deposition?  
14 A. This was provided to me in advance  
15 of the last deposition.  
16 Q. And you haven't looked at the  
17 document that's Exhibit 53 since then?  
18 A. That's correct.  
19 Q. Is there anything that's stated in  
20 Exhibit 53, as we sit here today, that you  
21 believe is inaccurate?  
22 A. If you will allow me to read it  
23 once again, I will tell you in a moment.  
24 Q. Please do.  
25 MR. BROWN: Let me just note for

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Page 98

1 defined."  
 2 Q. Yes. It refers to experiments  
 3 intended to increase our mutual knowledge of  
 4 the mechanisms at work.  
 5 Are those experiments described  
 6 anywhere in Exhibit 53?  
 7 A. I believe that these refer to the  
 8 final page 3 of 4 and 4 of 4 that describe  
 9 what is labeled as Experiment 5 and  
 10 Experiment 6.  
 11 Q. Okay. When did you agree to  
 12 define experiments?  
 13 A. I recall having agreed to define  
 14 experiments during the meeting that this --  
 15 that in which those film morphology results  
 16 were -- that I described earlier were  
 17 discussed.  
 18 Q. Do you have any recollection of  
 19 the conversation -- the specific conversation  
 20 at the meeting?  
 21 A. I do not.  
 22 Q. You said pages three and four.  
 23 Does page 2 of Exhibit 53 describe the  
 24 experiments that are defined?  
 25 A. They also describe the experiments

Page 100

1 that's on page 2 of 4 in Exhibit 53, does  
 2 the first line describe the purpose of  
 3 Experiment 6?  
 4 A. Yes, that's the intent of that  
 5 line to describe the purpose of Experiment 6.  
 6 Q. Experiment 6 refers to step  
 7 coverage. What is your understanding of step  
 8 coverage, as you use the term in Exhibit 53?  
 9 A. In this case, step coverage refers  
 10 to the uniformity of thickness of the seed  
 11 layer from the top to the bottom of an  
 12 inlaid structure.  
 13 Step coverage would typically be  
 14 expressed as a ratio of the thickness at the  
 15 -- of the bottom of the structure to the  
 16 thickness at the top of the structure.  
 17 Q. Is there such a thing as a step  
 18 that's being covered?  
 19 A. That is the -- that is exactly  
 20 correct. In this particular case, an inlaid  
 21 structure has a -- is referred to as a step,  
 22 or as an example of a step.  
 23 Q. In other terms, is it correct to  
 24 say that a step would include structures such  
 25 as trenches or vias?

Page 99

1 that were defined in tabular form on pages  
 2 three and four of this exhibit.  
 3 Q. Okay. What did you do -- what  
 4 steps did you take to define the experiments  
 5 that are on pages 2, 3 and 4 of Exhibit 53?  
 6 A. I'm very sorry. I don't  
 7 understand. The reason I don't understand is  
 8 because this seems extremely explicit as it  
 9 stands. What steps did I take?  
 10 I identified, as indicated here,  
 11 what the intention was, what the structure of  
 12 the wafers would be, what chemistries would  
 13 be employed, and what parameters would be  
 14 evaluated.  
 15 Q. Did you simply sit down and write  
 16 what's shown on pages 2, 3 and 4 of Exhibit  
 17 53?  
 18 A. After significant thought, yes.  
 19 Q. So, is it correct to say you  
 20 thought about it and then wrote it?  
 21 A. Yes.  
 22 Q. Did you consult any document or  
 23 any person in writing them?  
 24 A. I don't recall having done so.  
 25 Q. So, if we look at Experiment 6

Page 101

1 A. Yes.  
 2 Q. So, the first line under Exhibit  
 3 (sic) 6 says, "Determine if marginal PVD seed  
 4 layer step coverage can be improved by  
 5 supplementary electroless deposition."  
 6 What was intended to be  
 7 supplementary about the deposition?  
 8 A. The electroless deposition of  
 9 copper to supplement the presumed marginal PVD  
 10 seed layer.  
 11 Q. What was marginal about the seed  
 12 layer, or what was presumed to be marginal?  
 13 A. Presumed to be marginal was the  
 14 likelihood and the observation in previous  
 15 experiments that the seed layer was so thin  
 16 at the bottom as to become intermittently  
 17 discontinuous or so thin so that the plating  
 18 results were indistinguishable from having a  
 19 discontinuous seed.  
 20 Q. And what kind of improvement were  
 21 you looking for?  
 22 A. I was looking to have a fill  
 23 result that did not have voids associated  
 24 with the side wall of the structure that we  
 25 presumed were due to discontinuous PVD seed

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Page 94

1 THE REPORTER: What was the  
2 objection?  
3 MR. MELNIK: Vague.  
4 MR. BROWN: Join.  
5 THE WITNESS: These experiments  
6 were intended to evaluate the response in  
7 copper fill to a number of input parameters.  
8 In that sense, they -- characterizing the  
9 results on the basis of the set points. So,  
10 yes, they are characterization experiments.  
11 BY MR. RIEDINGER:  
12 Q. At the top of the Exhibit 53, the  
13 May 1, '97 memo, refers to Metallization  
14 Process Group. What was the Metallization  
15 Process Group?  
16 A. The Metallization Process Group was  
17 one of the terms by which the team working  
18 on electroplating was referred. Advanced  
19 Technology Group was one of those.  
20 ECD Division was another. As I  
21 think I may have mentioned, there was a  
22 number of organizational changes that were  
23 taking place during that period of time, and  
24 I do not recall exactly how long each of  
25 those iterations lasted or even necessarily

Page 96

1 Q. In the body on the first page --  
2 the body of text on the first page of  
3 Exhibit 53, the first line says, "Thanks for  
4 hosting yet another fascinating meeting."  
5 Do you know if the meeting that's  
6 referred to in that line is the meeting  
7 that's referred to in Exhibit 52?  
8 A. It was not. It was not. To the  
9 best of my recollection, it was not.  
10 Q. What meeting is referred to in the  
11 first line of Exhibit 53?  
12 A. My recollection is that Intel, Chun  
13 Mu in particular, provided us with a series  
14 of very well executed cross-sections of wafers  
15 that were -- represented the evolution of the  
16 copper deposition sequence from initial plating  
17 through complete plating and was able to, not  
18 only display the discreet photos, but also  
19 through electronic manipulation, show them as  
20 -- a an overlay so that it was possible to  
21 visualize how the film morphology was  
22 developing.  
23 And I do not recall that meeting  
24 being in concert with a meeting that had  
25 anything to do with reactor modeling.

Page 95

1 what the full scope of the changes were.  
2 The Metallization Process Group was  
3 the group of people who were working on,  
4 particularly, electroplating.  
5 Q. Do you know if, in May of '97,  
6 the Metallization Process Group was part of  
7 the Advanced Technology Group?  
8 A. I do not recall whether the  
9 Metallization Process Group was a replacement  
10 for, was a subset or superset of the ATG.  
11 Q. Who managed the Metallization  
12 Process Group?  
13 A. At that period of time, I believe  
14 it would have been Bob Berner.  
15 Q. And what, if anything, was your  
16 role within or with either one of the  
17 Metallization Process Group?  
18 A. In May, I would have been -- I  
19 believe, I would have still been working as  
20 the Manager of Process Development, but that  
21 was very close to a period of time in which  
22 I chose to take a job as the Technical  
23 Marketing Director.  
24 I do not recall whether May 1 was  
25 before or after that period of time.

Page 97

1 Q. Where did that meeting occur?  
2 A. We had meetings on this topic in  
3 both Santa Clara and in Kalispell. I do not  
4 recall where this one took place, but I seem  
5 to remember -- please excuse me on the  
6 vagueness -- that there were actually two  
7 meetings on this topic, one in Santa Clara  
8 and then a subsequent one in Kalispell.  
9 So, I do not -- that these same  
10 photographs were discussed. So, on May 1, I  
11 don't recall whether I would have been  
12 referring to a Santa Clara or a Kalispell  
13 meeting.  
14 Q. Does the reference to hosting a  
15 meeting suggest that the meeting took place  
16 at Intel --  
17 A. That suggests that, yes.  
18 MR. BROWN: Again, you need to let  
19 him finish his question.  
20 THE WITNESS: I'm very sorry.  
21 BY MR. RIEDINGER:  
22 Q. I would like to skip down to the  
23 third paragraph -- begins, "As agreed, I have  
24 roughly." Do you see that?  
25 A. "As agreed, I have roughly

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Page 106

1 page of Exhibit 53. The reference to second  
2 experiment. Is that Experiment 6?  
3 A. That's what is intended here.  
4 That is correct.  
5 Q. And it also refers to a short  
6 electroless deposition. How short is "short"?  
7 A. As intended here, this electroless  
8 copper deposition thickness targets were  
9 between 500 angstroms and 1500 angstroms.  
10 That's what was -- I was referring to a  
11 processed or a thickness that was insufficient  
12 to necessarily fill the inlaid structures  
13 independently -- independent of a subsequent  
14 electrolytic process.  
15 Q. So, it's a short thickness as  
16 opposed to a short amount of time?  
17 A. Short time in order to produce a  
18 small thickness.  
19 Q. Do you have any recollection of  
20 the amount of time?  
21 A. No, I don't.  
22 Q. Did you even have a concept as to  
23 the amount of time at the time that you  
24 wrote Exhibit 53?  
25 A. I knew that the electroless

Page 108

1 to precipitate circumstances where the seed  
2 layer would be discontinuous.  
3 Q. And then that same line refers to  
4 thickness splits. What is a thickness split?  
5 A. Thickness split. A split is a  
6 subset of an experiment. So, a thickness  
7 split would be ways of -- of -- please  
8 excuse -- parsing the experiment between  
9 groups of wafers that would receive, within  
10 those groups, a common set of parameters.  
11 So, in this case, approximately a  
12 third of the wafers or one split of the  
13 experiment would receive one thickness; a  
14 third of the wafers, approximately, would be  
15 a separate split with a 1000-angstrom  
16 thickness, et cetera.  
17 Q. So, since there were 45 wafers  
18 listed on page 4, there would be 15 in each  
19 of those thicknesses; is that correct?  
20 A. I haven't counted this. There are  
21 reasons in some experimental designs that they  
22 won't be absolutely symmetrical in count, but  
23 that would be roughly correct. I haven't  
24 counted this actual experiment.  
25 Q. Go to page 3 of Exhibit 53.

Page 107

1 processes varied significantly in their  
2 deposition rates, but we would anticipate  
3 deposition rates on the order of a couple of  
4 hundred angstroms per minute. So, yes, I had  
5 a concept that this would be a process that  
6 would take place over the range of between  
7 perhaps, one and ten minutes in that range.  
8 Q. Thank you. If we go to page 2  
9 of Exhibit 53. The seed layer refers to three  
10 thicknesses. The line seed layer under  
11 Experiment 6 refers to three thicknesses:  
12 500 angstroms, 1000 angstroms, and 1500  
13 angstroms.  
14 Why those particular -- why were  
15 those particular thicknesses included in the  
16 experiment design?  
17 A. I do not remember exactly which  
18 thickness Intel was using as their nominal  
19 value for wafers that they were submitting to  
20 Semitool for characterization work. However,  
21 I believe it was on the high end of that  
22 range. It was either 1000 angstroms or 1500  
23 angstroms.  
24 But the intention was to evaluate  
25 thinner films than their nominal specifically

Page 109

1 There is some handwritten material. Do you  
2 recognize the handwriting?  
3 A. No, I don't.  
4 Q. So, it's not yours?  
5 A. No, it's not.  
6 Q. Do you recognize the subject that's  
7 described in the handwriting?  
8 A. I know, in some cases, what it  
9 makes reference to.  
10 Q. And what does it make reference to  
11 in those cases where you know?  
12 A. The first line has DC and PR. In  
13 this case, "DC" means direct current. "PR"  
14 means pulse reverse. To the right-hand side  
15 of that, "FWD" means forward. Forward would  
16 be a process in which the plating current is  
17 pulsed but is not pulsed so that the wafer  
18 is alternately anodic and cathodic. It would  
19 be strictly cathodic, which is referred to as  
20 forward pulsing. 6.8 and 9.0, though I don't  
21 know for a fact, probably refer to the  
22 maximum current: 6.8 amps and 9 amps in the  
23 plating cell.  
24 The next line, it says, "5 baths."  
25 That would refer to the 5 bath types that

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Page 102

1 layers.  
 2 Q. Do you recall describing or  
 3 discussing Experiment 6 or the concept of  
 4 Experiment 6 at any meeting with the people  
 5 at Intel?  
 6 A. You know, I don't recall having  
 7 discussed it with them explicitly. I don't  
 8 recall that.  
 9 Q. If we go back to the first page  
 10 of Exhibit 53, the fourth paragraph, the  
 11 paragraph that begins, "The first experiment  
 12 is directly related."  
 13 A. Yes.  
 14 Q. The second sentence -- I'll just  
 15 read it to you -- reads: "The second  
 16 experiment is related to my proposal to  
 17 supplement the step-coverage of PVD seed  
 18 layers by a short electroless copper  
 19 deposition process prior to beginning  
 20 electrolytic plating; if you are at all  
 21 interested, we may choose to pursue this  
 22 either immediately or at some later date."  
 23 So, that sentence refers to quote,  
 24 "my proposal."  
 25 A. Yes.

Page 104

1 In fact, I do not recall whether or not  
 2 there had -- whether I had, in fact, come  
 3 across the concept through other work or had  
 4 conceptualized this either independently or  
 5 with my colleagues at Semitool before having  
 6 run across any other reference to it. I do  
 7 not recall the first instance.  
 8 BY MR. RIEDINGER:  
 9 Q. Do you recall discussing that  
 10 subject with anyone before May 1 of 1997  
 11 before you wrote this memo?  
 12 A. Oh, yes. In fact, I can recall  
 13 several discussions with Tom Ritzdorf, with  
 14 Jeff Turner mostly in reference to  
 15 experimental or customer demo results in which  
 16 voids were observed that we concluded were  
 17 associated as much with the limitations of  
 18 the seed layer than with the plating process  
 19 and our discussions as to what we could do  
 20 to possibly ameliorate that mostly so that  
 21 our plating process demo results didn't look  
 22 inadequate.  
 23 Q. When did your discussions with Mr.  
 24 Ritzdorf and Mr. Turner take place?  
 25 A. Prior to May 1st of 1997 and after

Page 103

1 Q. Do you recall making that proposal?  
 2 A. I -- that's -- the short answer is  
 3 no.  
 4 Q. Do you recall any discussions with  
 5 people at Intel at all about such a proposal?  
 6 A. Any recollection that I have is  
 7 extraordinarily vague. I seem to recall -- I  
 8 recall it very vaguely, yet again having  
 9 endorsed an idea with Intel that we should  
 10 attempt to produce better fill results by  
 11 augmenting their seed layer by doing an  
 12 electroless process, but I do not recall the  
 13 specific conversation.  
 14 This sentence is ambiguous in that  
 15 it doesn't necessarily refer to previous  
 16 discussions on the topic -- only my proposal.  
 17 Q. When is the first that you heard  
 18 of supplementing step-coverage of PVD seed  
 19 layers with a short electroless copper  
 20 deposition process?  
 21 MR. MELNIK: Objection, vague and  
 22 ambiguous.  
 23 MR. BROWN: Join.  
 24 THE WITNESS: I don't remember  
 25 when the first time that I heard of it was.

Page 105

1 my date of employment. I don't recall  
 2 exactly.  
 3 Q. Can we try to put some range on  
 4 it? Was it in 1997, for example?  
 5 MR. BROWN: Asked and answered.  
 6 THE WITNESS: Sorry. I don't  
 7 remember the specific time frame. I don't  
 8 recall whether it was the end of '96,  
 9 beginning of '97.  
 10 BY MR. RIEDINGER:  
 11 Q. Could you just refresh my  
 12 recollection? I know you were asked this  
 13 question at the last deposition, but when did  
 14 you start working at Semitool?  
 15 A. You know, I recall when -- as a  
 16 matter of fact, this was something that had  
 17 been asked several times, and I have not, in  
 18 the meantime, gone back and taken a look at  
 19 my tax records.  
 20 I do not remember exactly what my  
 21 date of employment was, but that's something  
 22 that you should have access to.  
 23 Q. Sometime -- well, we can find that  
 24 date. I would like to go back to the second  
 25 sentence in the fourth paragraph, the first

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Page 114

1 (sic) 6 other than the people listed on the  
2 front page of Exhibit 54?  
3 A. There was -- there was no  
4 intention to exclude anyone who was in the  
5 group at the time. So, I would have made  
6 individuals such as, Dr. Chen familiar with  
7 the results that I had --  
8 Q. Anyone else --  
9 A. -- that Intel had obtained.  
10 Anyone else specifically? No, I don't  
11 recall.  
12 Q. Let's go back to Exhibit 1053.  
13 The second page is headed "Experiment 6." Is  
14 that the same Experiment 6 as referred to on  
15 the second page of Exhibit 53?  
16 A. I'm sorry. I want to make sure I  
17 understand. Experiment 6.  
18 Q. Are the two references to  
19 Experiment 6 that are contained on the second  
20 page --  
21 A. Yes, that would have been the same  
22 -- the same experiment. That's correct.  
23 Q. Is it possible that a cut and  
24 paste process with a word processor was used  
25 to prepare either the reference to exhibit

Page 116

1 Q. Why did you sign the second and  
2 third pages of Exhibit 1053?  
3 A. I don't know.  
4 Q. Was that a common practice? Was  
5 that -- did you commonly sign documents of  
6 this kind?  
7 A. I commonly did, yes.  
8 Q. And why did you commonly do it?  
9 A. Simply to acknowledge that I had  
10 been the author of it.  
11 Q. And the third page of Exhibit 1053  
12 has some handwritten notations. Do you  
13 recognize those handwritten notations?  
14 A. The third page --  
15 Q. On the top.  
16 A. Yes, that is in my handwriting.  
17 Q. And what do they mean?  
18 A. They -- they mean that, in this  
19 particular case, the work to evaluate  
20 electroless copper supplement on PVD seed  
21 layers would be pursued with substrates  
22 obtained from Intel and that for CVD seed  
23 layers would be obtained on substrates  
24 obtained from LETI.  
25 THE REPORTER: From what?

Page 115

1 (sic) 6 on Exhibit 53 or the reference to  
2 exhibit (sic) 6 on Exhibit 1053?  
3 A. 1053. Sorry. The reference to  
4 exhibit (sic) 6 in which two locations,  
5 please?  
6 Q. The second page of 1053 and the  
7 second page of 53. In other words, is one  
8 cut and pasted from the other?  
9 A. Yes, I would say that that's true.  
10 Q. Is that your signature on the  
11 bottom of the second page of Exhibit 1053?  
12 A. Yes, it is.  
13 Q. And is it also your signature on  
14 the third page of the bottom -- of the  
15 bottom of the third page of Exhibit 1053?  
16 A. Yes, it is.  
17 Q. And if you go to the last page of  
18 Exhibit 1053, was that a document that was  
19 presented at an Advanced Technology Group  
20 meeting?  
21 A. I do not recall having made that  
22 specific presentation.  
23 Q. Do you recall if anyone else made  
24 the presentation using this document?  
25 A. I do not recall.

Page 117

1 THE WITNESS: L-E-T-I. L-E-T-I.  
2 BY MR. RIEDINGER:  
3 Q. And were experiments to evaluate  
4 electroless copper supplement of CVD seed  
5 layers on wafers obtained from LETI actually  
6 conducted?  
7 A. I don't recall. I know -- what I  
8 do recall is that we had significant  
9 difficulty in obtaining wafers from LETI, and  
10 whether this particular experiment was  
11 conducted is -- I do not remember.  
12 I do not recall having reviewed  
13 results from the execution of this experiment.  
14 Q. And the third page of Exhibit 1053  
15 has a date in the lower right corner, May 1,  
16 1997?  
17 A. On the third page? Yes.  
18 Q. Does that mean that the document  
19 -- the third page, at least, was prepared on  
20 May 1 of 1997?  
21 A. That is possible, but it's also  
22 possible that this was cut and paste with  
23 modifications indicating CVD rather than PVD  
24 seed layer and that the date was not updated.  
25 I do not know which of those two cases

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Page 110

1 are enumerated starting from what is in  
 2 quotations of "STI Basic Bath," and then  
 3 extending through one that says, "Copper Bath  
 4 M with all additives brighteners and  
 5 levellers."

6 Q. All right. Let's go on to the  
 7 next exhibit. Mr. Taylor, I'm going to hand  
 8 you -- or I have just handed you a copy of  
 9 what was previously marked as Exhibit 1053,  
 10 which is now before you. Do you recognize  
 11 Exhibit 1053?

12 MR. MELNIK: There appears to be  
 13 some text blanked out on page 16468 on the  
 14 right-hand side.

15 MR. RIEDINGER: Yes. That appears  
 16 to be the case, and I have not been able to  
 17 find any copy that does not have that text  
 18 blanked out.

19 THE WITNESS: I do recognize it  
 20 now. I hadn't recalled this before, but this  
 21 does refresh my recollection. So, yes, I do  
 22 recall this.

23 BY MR. RIEDINGER:

24 Q. Did you write Exhibit 1053 or any  
 25 portion of it?

Page 112

1 A. No, I don't.

2 Q. Do you recognize the format of  
 3 Exhibit 54?

4 A. Yes, I do.

5 Q. It's titled "Agenda." Did the  
 6 Advanced Technology Group have agendas of this  
 7 sort prepared before meetings of the group?

8 A. Occasionally.

9 Q. There are a list of presenters  
 10 under the heading "Agenda," including your  
 11 name. And next to your name is the  
 12 statement "Seed/barrier layer develop."

13 A. Yes.

14 Q. Do you see that?

15 A. Yes.

16 Q. Does that relate in any way to the  
 17 final page of Exhibit-1053?

18 A. I believe it does.

19 Q. How does it relate?

20 A. I believe that the experiments that  
 21 are described in Exhibit 1053 were the scope  
 22 of work taking place on barrier and seed  
 23 layer development that would have been  
 24 discussed in this meeting of May 2nd.

25 Q. Did you present information to the

Page 111

1 A. I did write, certainly, the pages  
 2 -- I'm not sure how to refer to these pages,  
 3 but in this packet that I have been handed,  
 4 the second and third page and don't recall  
 5 having written the last page.

6 Q. Do you recognize the last page?

7 A. Yes, I do.

8 Q. What is the last page?

9 A. The last page is a list of  
 10 experiments related to -- it's entitled and  
 11 relatively clear, Barrier and Seed Layer  
 12 Development.

13 MR. RIEDINGER: Let's mark another  
 14 exhibit and perhaps it can connect them  
 15 together. Would you mark this as the next  
 16 exhibit, please?

17 MR. BROWN: It's 54.

18 (The document referred to was  
 19 marked Taylor Exhibit-54 for identification.)

20 BY MR. RIEDINGER:

21 Q. Mr. Taylor, the court reporter has  
 22 marked as Exhibit 54, a single paged document  
 23 having production number 016466, and it's now  
 24 in front of you. Do you recognize Exhibit  
 25 54?

Page 113

1 Advanced Technology Group at any meeting that  
 2 you recall regarding the Experiment 6 that's  
 3 described in Exhibit 1053?

4 A. I don't recall -- do I recall? I  
 5 do not recall the specific circumstances. I  
 6 do know that I disseminated the information,  
 7 summarized it and disseminated it, but -- so,  
 8 I don't recall having done it at this  
 9 specific meeting, but yes, I do.

10 Q. Did you disseminate it to the  
 11 Advanced Technology Group?

12 A. Yes.

13 Q. And did that include the people  
 14 who were on -- listed on the front of  
 15 Exhibit 54?

16 A. Yes.

17 Q. Anyone else?

18 A. I don't recall who were -- who  
 19 were the attendees at either this meeting  
 20 that's explicitly shown in Exhibit 54 or in a  
 21 meeting in which I would have disseminated  
 22 the information from Experiment 6.

23 Q. Okay. So, are you able to  
 24 identify any other persons that you believe  
 25 received the information regarding exhibit

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Page 122

1 remember making this specific presentation.  
 2 Q. If you turn to the third page, the  
 3 page headed "Seed Layer Optimization."  
 4 A. The third page. One, two, three.  
 5 Seed Layer Optimization, yes.  
 6 Q. What is intended to be meant by  
 7 optimization?  
 8 A. Optimization is intended to mean  
 9 the methods by which existing vacuum  
 10 deposition methods could or should be  
 11 optimized for subsequent copper deposition.  
 12 Q. And by "vacuum deposition methods,"  
 13 are you referring to PVD and CVD?  
 14 A. Yes.  
 15 Q. Okay. Under "Major Issues" on  
 16 that same page, there is a reference to  
 17 step-coverage. What does that refer to?  
 18 A. That refers to as described  
 19 earlier, the attribute of vacuum deposited  
 20 films to have varying thicknesses from the  
 21 top to the bottom of inlaid structures.  
 22 Q. Does the presentation on April 4  
 23 of 1997 represent one of those discussions  
 24 that you mentioned earlier that you had about  
 25 the subject of step-coverage with other people

Page 124

1 the term "enhancement" in the title of that  
 2 slide of that foil?  
 3 A. What I meant was a process by  
 4 which a preexisting seed layer could be  
 5 supplemented by a wet chemical process prior  
 6 to anisotropic electrolytic deposition.  
 7 Q. Did you say a preexisting sub-layer  
 8 or seed layer?  
 9 A. Seed layer is what I said.  
 10 Q. Thank you. So, the rest of the  
 11 discussion on the fifth page, the page  
 12 entitled Seed Layer Enhancement deals with --  
 13 is it correct to say that it deals with the  
 14 process for supplementing a preexisting seed  
 15 layer?  
 16 A. Yes, and I'm going to refer to the  
 17 third sub-bullet of the first section. It  
 18 says, "Initial Seed Layer Requirements 200 to  
 19 500 angstroms."  
 20 Q. And why do you refer to that?  
 21 A. Because it is pertinent to your  
 22 question that this does, in fact, refer to  
 23 processes that imply the presence of a  
 24 previous seed layer.  
 25 Q. So, the reference to an "Initial

Page 123

1 at Semitool?  
 2 A. It falls into that category, yes.  
 3 I certainly could. Again, I do not recall  
 4 having the circumstances of actually standing  
 5 in front of my peers and making this  
 6 presentation.  
 7 Q. Do you recall having discussions of  
 8 seed layers step-coverage before the April 4,  
 9 1997 presentation?  
 10 A. I recall that the topic of  
 11 step-coverage and its impact on success of  
 12 electrolytic deposition would have been a  
 13 topic prior to April 4.  
 14 Q. Okay. When do you recall the  
 15 subject of step-coverage and its impact on  
 16 electrolytic deposition being first discussed  
 17 at Semitool?  
 18 A. I don't recall exactly when it was  
 19 first, but certainly prior to this time  
 20 frame.  
 21 Q. Let's turn to what, I guess, is  
 22 the fourth page -- the fifth page, production  
 23 number 010012 entitled "Seed Layer  
 24 Enhancement."  
 25 What did you mean when you used

Page 125

1 Seed Layer Requirements 200-500 angstroms"  
 2 means that the preexisting seed layer was  
 3 between 200 and 500 angstroms thick?  
 4 A. Anticipated to be in that range.  
 5 Q. And then that seed layer would be  
 6 supplemented?  
 7 A. That is correct.  
 8 Q. How would it be supplemented?  
 9 A. By either the electroless copper  
 10 method on thin PVD and CVD copper seed, or  
 11 alternatively and more speculatively, by  
 12 modified electroplating processes.  
 13 Q. And after the supplementation, how  
 14 thick would be -- how thick would the seed  
 15 layer be?  
 16 A. That's not identified here, but in  
 17 -- are you asking for my recollection of what  
 18 we were anticipating at the time?  
 19 Q. It's not clear what I was asking,  
 20 is it? Let me try again and ask a better  
 21 question.  
 22 In the seed layer enhancement  
 23 process that's described on the fifth page of  
 24 Exhibit 56, what, if anything, was the  
 25 expected ultimate thickness of the seed layer

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Page 118

1 pertains.  
 2 Q. Okay. If we go back to Exhibit  
 3 53, look at the fourth page. I would like  
 4 you to compare Exhibit 53, page 4, to Exhibit  
 5 1053, page 3.  
 6 Is one or the other cut and paste  
 7 to form the other?  
 8 A. No, because the post processing  
 9 sections are different.  
 10 Q. Okay. The final page of Exhibit  
 11 53 has a date May 1, 1997. Does that mean  
 12 that that page was prepared on that date?  
 13 A. I don't know.  
 14 MR. RIEDINGER: Let's take a  
 15 break.  
 16 THE WITNESS: Okay.  
 17 (Off the record.)  
 18 BY MR. RIEDINGER:  
 19 Q. Mr. Taylor, the court reporter has  
 20 marked three more exhibits. I have placed  
 21 them all before you. They have been marked  
 22 as Exhibit-55, 56 and 57. I'm putting them  
 23 before you to see if we can identify some of  
 24 those earlier conversations that you mentioned  
 25 in your testimony earlier today.

Page 120

1 A. Yes.  
 2 Q. Did you have the same position in  
 3 the beginning of April that you previously  
 4 described -- position where you were in  
 5 charge of managing Process Development?  
 6 A. Yes.  
 7 Q. There is a reference in the agenda  
 8 under the heading "presentations to team  
 9 leaders." What was a team leader?  
 10 A. Team leader. In this particular  
 11 case, these individuals would have had a  
 12 focus project that they were overseeing and  
 13 pulling resources, as required, whether from  
 14 direct reports or distributed through the  
 15 Advanced Technology Group to focus on these  
 16 specific technology thrusts.  
 17 Q. Were you a team leader in April of  
 18 1997?  
 19 A. Yes.  
 20 Q. Were you a team leader for seed  
 21 layer development?  
 22 A. That's correct.  
 23 Q. Do you believe that you gave a  
 24 presentation regarding seed layer development  
 25 at an April 4, 1997 meeting?

Page 119

1 Exhibit 55 is a single page  
 2 document having production numbers 001823.  
 3 Exhibit-56 is a document having  
 4 production numbers 01008 through 0014.  
 5 And Exhibit-57 is a multi-page  
 6 document having production numbers 09884  
 7 through 9901.  
 8 Let's start with Exhibit 55. Do  
 9 you recognize Exhibit 55?  
 10 A. No, I don't.  
 11 Q. Your name is listed in the "to"  
 12 list --  
 13 A. Yes, I understand.  
 14 Q. -- I guess, the fourth person?  
 15 A. This absolutely looks similar to  
 16 literally hundreds of documents of this nature  
 17 that I received, but I don't recognize this  
 18 one specifically.  
 19 Q. Do you recognize the format --  
 20 A. Yes.  
 21 Q. -- of the document as an agenda?  
 22 A. Yes.  
 23 Q. Were agendas typically prepared in  
 24 formats like this before meetings of the  
 25 Advanced Technology Group?

Page 121

1 A. I believe that I did.  
 2 Q. Could you take a look at Exhibit  
 3 56? Do you recognize Exhibit 56?  
 4 A. Yes, I do.  
 5 Q. What is Exhibit 56?  
 6 A. Exhibit 56 is a presentation on  
 7 the topics of barrier, and seed layer, and  
 8 integration concerns with copper deposition.  
 9 Q. Did you prepare Exhibit 56?  
 10 A. I believe I did.  
 11 Q. All of the pages except the first  
 12 page of Exhibit 56 have handwritten notations  
 13 in the lower right corner. I think they are  
 14 legible in the last three pages, at least.  
 15 Do you recognize the handwritten notations?  
 16 A. Yes. My last name in my  
 17 handwriting and the date.  
 18 Q. April 4th of 1997?  
 19 A. Yes.  
 20 Q. Does Exhibit 56 represent foils  
 21 that you presented on April 4th of 1997?  
 22 A. I believe that's true, yes.  
 23 Q. Are they foils that you presented  
 24 to the Advanced Technology Group?  
 25 A. I believe that's true. I do not

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Page 130

1 Q. What is a strike bath?  
 2 A. As intended by me when I wrote  
 3 this, a strike bath is conceptually a bath  
 4 that is capable of nucleating on relatively  
 5 non-conductive or low conductivity surfaces.  
 6 It's a -- refers to a specific bath  
 7 formulation and conditions of employing that  
 8 bath specifically to nucleate on structures  
 9 that might not otherwise -- structures and  
 10 materials that might not otherwise.  
 11 Q. And how, if at all, would a seed  
 12 layer be enhanced using the strike bath  
 13 concept?  
 14 A. The intention would be to allow  
 15 nucleation on regions of barrier that were  
 16 incompletely covered by an initial PVD seed  
 17 layer or CVD seed layer.  
 18 Q. And in the second bullet point  
 19 under "Modified Electroplating" refers to  
 20 Electrolyte/Plating Conditions Optimized for  
 21 Early Film Growth. What does that refer to?  
 22 A. Again, somewhat speculative, but we  
 23 knew and know today that the electrolyte  
 24 formulation, whether it's the inorganic or the  
 25 organic components, as well as, plating

Page 132

1 improve the performance of the seed layer?  
 2 A. I believed that it had attributes  
 3 that had promised to do so and justified the  
 4 resources to conduct experiments to explore  
 5 it.  
 6 Q. And what made you think that the  
 7 electroless deposition had attributes that  
 8 might improve the seed layer performance?  
 9 A. Because it did not require as a  
 10 prerequisite the applied current. It did not  
 11 -- let me put it this -- that appropriately  
 12 formulated electroless baths should be capable  
 13 of depositing on an appropriately catalytic  
 14 surface, whether that surface was continuously  
 15 conductive or not, and that electroless  
 16 processes have frequently been used for  
 17 depositing metals on entirely non-conductive  
 18 surfaces if they are prepared in advance.  
 19 It's one of the means by which plating on  
 20 plastics, as an example, is conducted.  
 21 So, it was a technical assessment  
 22 that if we needed to deposit a thin film on  
 23 an exposed and relatively conductive barrier  
 24 that electroless was a candidate process for  
 25 doing so.

Page 131

1 conditions such as, applied current density  
 2 have an impact on whether a film is deposited  
 3 conformally or whether it tends to exhibit a  
 4 property called super fill. And the  
 5 intention here was to explore ranges of  
 6 electrolyte formulation and plating conditions  
 7 that might allow us to deposit conformal  
 8 films rather than anisotropically deposited  
 9 films that would form a supplementary layer  
 10 on the seed layer prior to a bulk deposition.  
 11 Q. Okay. The phrase, "Modified  
 12 Electroplating," does that refer to an  
 13 electrolytic process?  
 14 A. Yes.  
 15 Q. Let's go back to the electroless  
 16 process in the first bullet point.  
 17 Did you believe that the  
 18 electroless process would improve step-coverage  
 19 on April 4 of 1997?  
 20 A. I believed that it would improve  
 21 -- I believed that it would deposit a  
 22 conformal film on the preexisting seed layer.  
 23 I did not know whether it would improve  
 24 step-coverage, per se.  
 25 Q. Did you believe that it would

Page 133

1 Q. Do you recall discussing the  
 2 subject of depositing a conformal layer on  
 3 seed layers with anyone before the April 4th,  
 4 1997 date?  
 5 MR. BROWN: Asked and answered.  
 6 MR. MELNIK: Join.  
 7 MR. RIEDINGER: It's a slightly  
 8 different question. I'm talking about conformal  
 9 layers now.  
 10 THE WITNESS: I recall that in the  
 11 context of trying to determine how to resolve  
 12 plating process faults associated with  
 13 discontinuous seed layers that the concepts of  
 14 using wet chemical processes to supplement  
 15 those seed layers, those discussions had taken  
 16 place prior to the time frame of -- that  
 17 these foils were generated -- prior to the  
 18 time frame where I had thought these  
 19 particular bullet points. But the specific  
 20 date or the individuals involved -- the only  
 21 individual that I can say with some degree of  
 22 certainty was involved in those discussions  
 23 would have been Tom Ritzdorf who was  
 24 principal -- was my peer with whom I shared  
 25 virtually all technical insights, questions, et

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Page 126

1 after the enhancement process?  
 2 A. Unfortunately, I can't recall what  
 3 my estimates were at the time because they  
 4 have been supplemented by the last five years  
 5 of learning. So, I can't remember exactly  
 6 what I had anticipated the final thickness  
 7 target would be back in April of 1997. I  
 8 know what I think they should be now, but  
 9 that's not the right answer.  
 10 Q. Do you recall describing a seed  
 11 layer enhancement process of the kind shown  
 12 on page five of Exhibit 56 to the Advanced  
 13 Technology Group?  
 14 A. I recall having distributed  
 15 documents of the sort that we've referred to  
 16 in previous exhibits that refer to  
 17 specifically, electroless processes with target  
 18 thicknesses of between 500 and 1500 angstroms.  
 19 Q. And is it possible that the seed  
 20 layer enhancement process that is described on  
 21 the fifth page of Exhibit 56 had the same  
 22 target thicknesses?  
 23 A. Yes, it's possible.  
 24 Q. Are other thicknesses possible --  
 25 target thicknesses?

Page 127

1 A. Yes, other thicknesses are  
 2 possible.  
 3 Q. What other target thicknesses are  
 4 possible?  
 5 A. Thinner or thicker than the 500 to  
 6 1500-angstrom range.  
 7 Q. How much thinner and how much  
 8 thicker?  
 9 MR. MELNIK: Objection, calls for  
 10 speculation, asked and answered.  
 11 THE WITNESS: Down to anatomic  
 12 thickness and up to the point where the  
 13 feature is completely blocked by the deposited  
 14 electroless copper.  
 15 BY MR. RIEDINGER:  
 16 Q. Actually, I was probably trying to  
 17 ask a question that I didn't convey to you  
 18 very well. At the time that this page was  
 19 prepared, the seed layer enhancement page, I'm  
 20 looking for a range, to the best of your  
 21 recollection, of the target thicknesses that  
 22 you considered to be what was within the seed  
 23 layer enhancement concept described in that  
 24 page.  
 25 A. To the best of my recollection --

Page 128

1 go ahead.  
 2 MR. MELNIK: I'm sorry.  
 3 Objection, asked and answered, calls for  
 4 speculation. Thank you.  
 5 THE WITNESS: To the best of my  
 6 recollection, the range of 500 to 1500  
 7 angstroms was the target range for purposes,  
 8 not only of anticipated benefit to the  
 9 structure, but also the range of control of  
 10 the process.  
 11 To the best of my recollection, I  
 12 do not remember that we believed or I  
 13 believed that we could reliably produce films  
 14 of less than 500 angstroms with the processes  
 15 that were available to us at the time.  
 16 BY MR. RIEDINGER:  
 17 Q. Target thickness?  
 18 A. Target electroless thickness.  
 19 Q. And after the electroless  
 20 deposition, did you contemplate that there  
 21 would be a subsequent electrolytic deposition?  
 22 A. Yes.  
 23 Q. Did you call that "bulk fill"?  
 24 A. I have frequently referred to it  
 25 as "bulk fill."

Page 129

1 Q. The same page -- the Seed Layer  
 2 Enhancement page has a bullet point -- a  
 3 sub-bullet point. It says, "Less Sensitive  
 4 to Initial Seed Layer Discontinuities."  
 5 Do you have a recollection of what  
 6 that refers to?  
 7 A. What this means is that electroless  
 8 depositions of a supplementary film should be  
 9 less sensitive to the initial seed layer  
 10 discontinuities than an alternative  
 11 electroplating process which relies upon, to  
 12 some degree, the conductivity of either the  
 13 barrier or the seed layer for producing a  
 14 uniform deposit.  
 15 Q. Who was present at the  
 16 presentation?  
 17 A. I don't recall having made this  
 18 presentation, so I don't recall who was  
 19 present.  
 20 Q. Do you know if the presentation  
 21 was made to anyone outside of Semitool?  
 22 A. I do not know.  
 23 Q. Under "Modified Electroplating,"  
 24 there is a reference to "Strike Bath."  
 25 A. Yes.

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Page 138

1 MR. BROWN: Foundation.  
 2 BY MR. RIEDINGER:  
 3 Q. Experiment No. 6 that's referred  
 4 to, for example, in Exhibit 53?  
 5 A. This experiment is clearly not the  
 6 same as was specified in the design of  
 7 Experiment No. 6.  
 8 Q. Is it -- does Exhibit 1000  
 9 describe the results of an eventual evolution  
 10 or variation on Experiment No. 6?  
 11 A. My recollection is that Experiment  
 12 No. 6 was deemed by Intel as being  
 13 excessively large with too many wafers, and  
 14 consequently, they asked, if I recall  
 15 correctly, for a demonstration of feasibility  
 16 before committing a large number of wafers  
 17 for the plan that I had proposed.  
 18 My recollection is that these five  
 19 wafers represented a quick feasibility check  
 20 prior to Intel's deciding to move forward  
 21 with an electroless seed layer enhancement  
 22 process.  
 23 Q. A quick feasibility check on the  
 24 concept of Experiment 6; is that correct?  
 25 A. Yes, that's my recollection.

Page 140

1 the originally proposed Experiment 6.  
 2 Q. Is that modification shown on page  
 3 2 of Exhibit 1054?  
 4 A. Yes.  
 5 Q. What was the modification?  
 6 A. The modification was to redesign  
 7 the experiment to require only 15, rather  
 8 than 45, wafers; their modifications in the  
 9 nominal electroless copper thickness targets, I  
 10 believe. And seed layer thicknesses, I would  
 11 have to go back and take a look again --  
 12 whether or not the seed layer thicknesses  
 13 that are expected here were changed, but I  
 14 believe they were. Rather than 500 to 1500  
 15 angstroms, from 500 to 1000 angstroms.  
 16 Q. And then, I would like you to look  
 17 at Exhibit 1056. Do you recognize Exhibit  
 18 1056?  
 19 A. Yes, I do.  
 20 Q. Did you write Exhibit 1056?  
 21 A. Yes, I did.  
 22 Q. And what is Exhibit 1056?  
 23 A. Exhibit 1056 is a compilation of  
 24 different documents produced at different  
 25 times.

Page 139

1 MR. BROWN: Object as vague to the  
 2 question.  
 3 THE WITNESS: I'm sorry. I'm not  
 4 giving you enough time.  
 5 MR. BROWN: That's okay.  
 6 BY MR. RIEDINGER:  
 7 Q. Before we go to Exhibit 57, why  
 8 don't we see if we can get a little bit more  
 9 of your understanding of how the proposals  
 10 for exhibit -- for Experiment 6 changed, if  
 11 they did at all.  
 12 So, I'm handing you a copy of what  
 13 was previously marked as Exhibit 1054 and a  
 14 copy of what was previously marked in another  
 15 deposition as Exhibit 1056.  
 16 Starting with Exhibit 1054, do you  
 17 recognize it?  
 18 A. Yes, I do.  
 19 Q. Did you write Exhibit 1054?  
 20 A. Yes, I did.  
 21 Q. And does your signature appear on  
 22 the first page?  
 23 A. Yes, it does.  
 24 Q. What is Exhibit 1054?  
 25 A. 1054 represents a modification of

Page 141

1 Q. Did you write all of them?  
 2 A. My recollection is that I authored  
 3 all of these.  
 4 Q. Okay. Can you identify for me  
 5 which groups of paper represent a single  
 6 document, if any? I'm assuming that one or  
 7 more pages in this represent a single  
 8 document. I'm trying to identify the  
 9 documents that make up Exhibit 1056.  
 10 A. Yes, I am too. The first page of  
 11 1056 is the same as the first page, to the  
 12 best of my ability to tell, of 1054.  
 13 Q. Before you go on, I note that on  
 14 the first page of 1056, there is the  
 15 statement underneath the line that says,  
 16 "Following text is copied from a fax  
 17 originally transmitted on Friday, May 23, but  
 18 not received."  
 19 A. Yes. So --  
 20 Q. Do you recall that event occurring?  
 21 A. I do not recall that event  
 22 occurring.  
 23 Q. And then what other documents --  
 24 A. The second page that this says,  
 25 "Pages Including Cover: 2" -- the second page

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<p align="right">Page 134</p> <p>1 cetera. Other individuals, I do not recall  2 having sat across the table or face-to-face  3 with them and discussed this.  4 BY MR. RIEDINGER:  5 Q. Okay. Thank you. Were  6 experiments ultimately conducted that showed --  7 conducted at Semitool -- that showed that an  8 electroless copper deposition process created  9 conformal layers that improved the seed layer  10 function?  11 A. My recollection is that the limited  12 number of experiments that were conducted were  13 deemed to be unsuccessful, in that we were  14 either unable to deposit electroless copper on  15 regions where the seed layer was already  16 discontinuous or alternatively, it did not  17 produce a conformal layer, in fact, produced  18 a scenario where we deposited excessive  19 material at the upper regions of the step as  20 compared to the amount deposited in the lower  21 regions of the step leading to unsuccessful  22 bulk deposition.  23 MR. MELNIK: I'm sorry. Could I  24 have the question read back to which Mr.  25 Taylor gave the answer?</p>	<p align="right">Page 136</p> <p>1 were observations of both center slit-like  2 voids, as well as, voids on the side walls  3 of structures.  4 In the case of the former, center  5 voids would have indicated a tendency of the  6 electroless film to pinch off at the top of  7 the structure or to be so preferentially  8 deposited at the top of the structure as to  9 give rise to subsequent pinch off in bulk  10 deposition.  11 In the latter case where voids  12 were observed on the side wall --  13 THE REPORTER: Would you slow  14 down?  15 THE WITNESS: Yes.  16 THE REPORTER: In the case where  17 voids --  18 THE WITNESS: -- were observed on  19 the side wall, we would have concluded that  20 the electroless process was unsuccessful in  21 producing a continuous seed layer in those  22 regions.  23 BY MR. RIEDINGER:  24 Q. If you look -- excuse me -- if  25 you look at the second page of Exhibit 1000</p>
<p align="right">Page 135</p> <p>1 THE REPORTER: Just the question?  2 MR. MELNIK: Yes.  3 (Record read.)  4 MR. RIEDINGER: And you provided  5 an answer. Thank you.  6 BY MR. RIEDINGER:  7 Q. At your last deposition, you were  8 asked regarding Exhibit 1000 -- I'm putting  9 another copy of that in front of you. And I  10 don't intend to go over the questions that  11 you were asked about Exhibit 1000 before, but  12 my question is, does Exhibit 1000 represent  13 the results that you just described?  14 MR. BROWN: Vague. Compound.  15 THE WITNESS: This is an example  16 of an experiment that produced results such  17 as I have just described.  18 BY MR. RIEDINGER:  19 Q. And I believe your answer indicated  20 that there are different ways that there was  21 a lack of success. Which kinds of lack of  22 success, if any, is shown by Exhibit 1000?  23 MR. BROWN: Vague as to "success."  24 MR. MELNIK: Join.  25 THE WITNESS: In this case, there</p>	<p align="right">Page 137</p> <p>1 under the heading "Summary," the first  2 sentence reads, "Electroless plating was used  3 to enhance the seed layer of four  4 experimental wafers with some success." Do  5 you agree with that conclusion?  6 MR. BROWN: Vague.  7 MR. MELNIK: Join.  8 THE WITNESS: Actually, my  9 technical assessment of this experiment was  10 that it was unsuccessful in that we were  11 attempting show the small structures could be  12 improved, but this does suggest that the  13 larger structures that were filled, in any  14 event, were not pinhole structure resulting in  15 the trench being shut off -- it appears as  16 though this may have had some -- some  17 measurable benefit on larger structures but  18 not smaller ones.  19 BY MR. RIEDINGER:  20 Q. And which size structures are you  21 characterizing as larger?  22 A. Larger trenches, in particular,  23 larger than about 0.7 microns.  24 Q. Thank you. Does Exhibit 1000  25 describe the results of Experiment No. 6?</p>

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Page 146

1 improvements were going to be required on a  
2 number of attributes, the projection for what  
3 was going to be needed or what would actually  
4 be introduced over the period from 1996, '97  
5 through 2001.

6 Q. Do you know when the Hardware  
7 Generation Roadmap on the last page of  
8 Exhibit 1056 was prepared?

9 A. I don't recall exactly when I did  
10 it.

11 Q. Do you know who it was provided  
12 to?

13 A. It was provided to Bob Berner, and  
14 I believe it was also provided to our  
15 marketing organization.

16 Q. Was it provided to anyone else  
17 within the Advanced Technology Group?

18 A. It was available to the other  
19 members of the Advanced Technology Group.

20 Q. You say, "available." How was it  
21 available?

22 A. It was -- there was no -- there  
23 was no segregation of this information. It  
24 was available either because it had been  
25 presented in front of them during one of

Page 148

1 A. I don't remember.

2 Q. We are just about finished. I'll  
3 probably take a break to clean up, but there  
4 are a couple of questions I do want to ask.

5 Do you currently live in Oregon?

6 A. I do.

7 Q. Where do you live?

8 A. I live in Portland downtown.

9 Q. Do you have any current plans to  
10 move out of Oregon?

11 A. I do not have any current plans to  
12 move out of Oregon.

13 Q. Which Applied Materials facility do  
14 you work in?

15 A. I work out of the facility in  
16 Hillsboro, E-Tech, which is an Applied  
17 Materials' subsidiary.

18 Q. Are you still attending school?

19 A. I am not, much to my chagrin.

20 Q. Do you intend to return to school  
21 at any point?

22 A. I intend to, but no specific  
23 plans. I haven't re-enrolled.

24 Q. I would like your current exact  
25 address, if you don't mind.

Page 147

1 these group meetings, or it was alternatively  
2 available at their request from the -- from  
3 either myself or from the departmental  
4 administrator.

5 Q. Okay. Let's go to Exhibit 57.  
6 It's this one.

7 A. Okay.

8 Q. Do you recognize Exhibit 57?

9 MR. MELNIK: I was pointing out to  
10 Counsel for Applied that the source of the  
11 bad seed layers seems to be Applied  
12 Materials.

13 MR. BROWN: I noted that it was  
14 within Roman's character to notice that.

15 THE WITNESS: These are -- these  
16 are familiar. I do not recall these  
17 specifically out of the many dozens of  
18 photographs that were exchanged with Intel.

19 BY MR. RIEDINGER:

20 Q. If you go back to Exhibit 53 --  
21 yes, that one -- which referred to being  
22 shown experimental observations. Do the  
23 photographs that are Exhibit 57 correspond to  
24 the experimental observations that are  
25 discussed in Exhibit 53?

Page 149

1 A. 0308 Southwest Montgomery Street,  
2 No. 206, Portland, Oregon, 97201.

3 MR. RIEDINGER: And I've been told  
4 we need to change the tape. So, let's take  
5 a break right now.

6 (Off the record.)

7 BY MR. RIEDINGER:

8 Q. Just a couple more questions, Mr.  
9 Taylor. Are you aware of any documents that  
10 we haven't talked about today, but which you  
11 believe would help tell the story of the  
12 development of seed layer enhancement at  
13 Semitool?

14 A. No, I'm not aware of any documents  
15 that would aid this process or make any  
16 reference, in fact, to the development of  
17 seed layer enhancement at Semitool.

18 Q. Did you do anything to prepare for  
19 today's deposition?

20 A. I did nothing to prepare for  
21 today's deposition.

22 Q. You didn't meet with anyone?

23 A. And please excuse me. Yesterday  
24 afternoon, I met with Nicholas here in this  
25 office for a period of about two hours.

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Page 142

1 of this exhibit doesn't appear to have a  
2 specific connection to the first page, nor do  
3 any of the following pages.  
4 Q. Is page 2 the second page,  
5 production number --  
6 A. Of 1056?  
7 Q. Yeah -- 20770 --  
8 A. Yes.  
9 Q. -- second page of Exhibit 1056, is  
10 that page, by itself, a separate document?  
11 MR. BROWN: Do you mean separate  
12 from the first page or you mean separate,  
13 standing alone and having no relation to any  
14 of the other pages?  
15 BY MR. RIEDINGER:  
16 Q. A separate document by itself,  
17 standing alone with respect to all of the  
18 other pages in Exhibit 1056.  
19 A. I believe that's true.  
20 Q. What is the second page of Exhibit  
21 1056?  
22 A. Second page of this exhibit is  
23 entitled "Recommended Experimental Strategies"  
24 and describes three types of experiments that  
25 are recommended to be pursued.

Page 144

1 in Exhibit 53 for Experiment 5?  
2 A. I don't know.  
3 Q. Let's move on to page 20776,  
4 which, I believe, is the eighth page of  
5 Exhibit 1056. What is that?  
6 A. As I recall, these were  
7 experiments. This is a brief summary of the  
8 total number of wafers employed to conduct  
9 Experiments numbered 6 through 11 that were  
10 conducted with wafers provided by Intel.  
11 Q. Sorry. This was a plan, or they  
12 were a description of what was actually done?  
13 A. My recollection is that this is a  
14 description of what was actually done as a  
15 way of accounting to Intel for the total  
16 number of wafers that had been employed to  
17 that -- to that date.  
18 Q. Okay. When was page eight, that's  
19 20776, prepared?  
20 A. I don't know. I don't remember.  
21 Q. Does the first box on page 20776  
22 describe the experiments that were reported in  
23 Exhibit 1000?  
24 A. In Exhibit 1000, only five wafers  
25 are reported, and this box refers to an

Page 143

1 Q. Do you know when that was written?  
2 A. I do not.  
3 Q. Do you know why you wrote it?  
4 A. Because I wanted to recommend the  
5 three experimental strategies.  
6 Q. Do you know who, if anyone, it was  
7 given to?  
8 A. I do not remember.  
9 Q. And then the next four pages,  
10 which are production pages 20771 through 775.  
11 Do they make up a separate document? I  
12 guess that's five pages.  
13 A. Yes, they do make up a separate  
14 document, and they -- each page is associated  
15 with what's called a specific bath type, bath  
16 type 1, 2, 3, 4 and 5.  
17 Q. Do they correspond to anything else  
18 that's described in Exhibit 1056?  
19 A. There is a similarity to the  
20 experiment design to an experiment recommended  
21 on page 2, but there are differences between  
22 what was actually reported in this five pages  
23 and what was part of this recommendation.  
24 Q. Do they -- do those five baths  
25 correspond to the baths that are identified

Page 145

1 experiment with 15 wafers.  
2 Q. Does page 20776 refer to a  
3 variation, then, of Experiment 6 that was  
4 considered at sometime?  
5 A. That's my recollection.  
6 Q. Do you know if the variation  
7 that's described on page 20776 was actually  
8 conducted?  
9 A. I do not recall whether an  
10 experiment involving 15 wafers were conducted.  
11 Q. Who, if anyone, was page 20776  
12 provided to?  
13 A. I believe that this -- my  
14 recollection is that this was provided to  
15 Intel as a way of accounting for the total  
16 number of wafers required to conduct either a  
17 proposed or completed experimentation.  
18 Q. Do you know who at Intel?  
19 A. I believe it was Chun Mu. He was  
20 my principal point of contact through this  
21 entire period of time.  
22 Q. In the last page of Exhibit 1056,  
23 what is that?  
24 A. This is a road map that was  
25 produced to highlight what technological

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Page 154

1 A. One moment, please. "No Clean  
2 Before Electroless" -- ECD 1.5 pre-wet no --  
3 this one had no pre-wet or pre-clean, which  
4 is what that's referring to. And since it  
5 does have the full thickness of ECD deposit,  
6 that would have to refer to wafer 335.  
7 Q. Okay. And going back to the third  
8 SEM, do you see the feature that sort of has  
9 a white box around it on the right-hand side  
10 of the SEM?  
11 A. Yeah. The white box has the  
12 dimensions listed on the upper -- upper,  
13 upper left-hand side.  
14 Q. And is that feature about 0.7, 0.8  
15 microns?  
16 A. At least according to the way the  
17 boxes are set with this -- reported here by  
18 the SEM as 0.73.  
19 THE REPORTER: By the?  
20 THE WITNESS: S-E-M.  
21 BY MR. MELNIK:  
22 Q. As 0.7 microns?  
23 A. 0.73 is what it says. That's the  
24 box dimension.  
25 Q. And do you see -- and this feature

Page 156

1 experiment," I mean the electroless enhancement  
2 experiment.  
3 A. All right.  
4 Q. -- that it was unsuccessful for  
5 the smaller structures but showed some  
6 improvement for the larger structures?  
7 A. That's fair. I mean, the focus of  
8 my previous comment was on the small  
9 structures and the larger structures -- I  
10 won't argue with Matt's conclusion. Yes, it  
11 did seem to be successful for the larger  
12 ones, but not for the small ones.  
13 MR. MELNIK: Thank you. I don't  
14 have any further questions.  
15 MR. RIEDINGER: I have no further  
16 questions.  
17 MR. BROWN: I have none.  
18 MR. RIEDINGER: Thank you very  
19 much.  
20 (Whereupon, the deposition concluded  
21 at 11:44 a.m.)  
22 .  
23 .  
24 .  
25 .

Page 155

1 shows a process where PVD seed layer was  
2 enhanced by an electroless step prior to  
3 electrolytic fill?  
4 A. That's the intention here, right.  
5 Q. And do you see any large center  
6 voids in the 0.7 micron feature of the type  
7 that we saw on SEM number five and number  
8 six?  
9 A. No, these are different. The  
10 quality of the SEM is really pretty poor, but  
11 there is nothing like the center -- center  
12 void that was on five or six.  
13 Q. So, does comparing SEM No. 3 with  
14 SEM No. 5 show that the electroless  
15 enhancement process improved the quality of  
16 the subsequent fill for the 0.7 micron  
17 feature?  
18 A. That's -- that seems to be the  
19 case. I think that's the basis for the --  
20 for the conclusion that Matt Johnson offered  
21 that there did appear to be some success on  
22 the larger structures.  
23 Q. So, when you said that this  
24 experiment was unsuccessful, did you mean that  
25 it was unsuccessful for -- when I say, "this

Page 157

1 DESCRIPTION OF EXHIBITS  
2 Exhibit Description  
3 50 10-24-96 Memo  
4 51 Organizational Chart  
5 52 4-29-97 Memo  
6 53 5-1-97 Fax  
7 54 5-2-97 Agenda  
8 55 4-2-97 Agenda  
9 56 Production No. NOVONLY010008-14  
10 57 Production No. 009884-901  
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Page 150

1 It's exactly correct. Please excuse me.  
 2 Q. Did you review any documents at  
 3 the time?  
 4 A. At that time, we didn't exchange  
 5 any documents. The only document that we made  
 6 reference to was this transcript of the  
 7 previous deposition.  
 8 Q. And the meeting was between you  
 9 and Mr. Brown only?  
 10 A. Yes, that is correct.  
 11 MR. RIEDINGER: I have no further  
 12 questions.  
 13 MR. MELNIK: Can we take a  
 14 one-minute break, and then I have just a few  
 15 questions.  
 16 MR. RIEDINGER: Sure.  
 17 (Off the record.)  
 18 EXAMINATION:  
 19 BY MR. MELNIK:  
 20 Q. Okay. Mr. Taylor, if I could ask  
 21 you, please, to pull up -- pull up a copy of  
 22 the Matt Johnson memo, Exhibit 1000.  
 23 A. Okay.  
 24 Q. And --  
 25 A. Got it here.

Page 152

1 two that are labeled "ECD only" in the upper  
 2 left-hand corner?  
 3 A. "ECD only," right.  
 4 Q. Okay. And do you have an  
 5 understanding of what the term "ECD only"  
 6 means?  
 7 A. In this particular case, this would  
 8 have been in reference to the wafer I.D. 341  
 9 where it had no electroless deposition.  
 10 Q. So, this was a wafer that had PVD  
 11 seed and then electroplating on top?  
 12 A. Yes. ECD only and the fact 341  
 13 is explicitly identified here on this -- this  
 14 SEM.  
 15 Q. Both SEMs?  
 16 A. Yes, on both of them.  
 17 Q. And in reviewing the fifth and  
 18 sixth SEM that refer to wafer 341, do you  
 19 observe that -- well, on the fifth SEM, the  
 20 one that's labeled 341-8 --  
 21 A. Yes.  
 22 Q. -- what is the feature size of the  
 23 features that are shown there?  
 24 A. It appears to be at the top in  
 25 the range of 0.7, 0.8 microns --

Page 151

1 Q. -- I'm also going to give you  
 2 another copy of it that was one of the high  
 3 quality copies that was produced during Dr.  
 4 Stevens' deposition. It has a different  
 5 Bates number, but it has higher quality SEMs.  
 6 A. All right.  
 7 Q. I would like this one back. It's  
 8 just for the witness to refer to the high  
 9 quality SEMs?  
 10 MR. RIEDINGER: Do you mind if I  
 11 take a quick look?  
 12 MR. MELNIK: Sure. It's totally  
 13 clean.  
 14 MR. RIEDINGER: Thank you.  
 15 BY MR. MELNIK:  
 16 Q. Okay. Mr. Taylor, could you  
 17 please take a look for me at the fifth and  
 18 sixth SEMs, the ones that are labeled "ECD  
 19 only"?  
 20 A. I want to make sure I understand  
 21 which page are we talking about? 3097?  
 22 Q. You know, I'm --  
 23 A. Fifth and sixth SEMs?  
 24 Q. Yeah. I am sorry. The Bates  
 25 numbers on mine are different. They are the

Page 153

1 Q. Okay?  
 2 A. -- based on the scaler shown at  
 3 the bottom.  
 4 Q. And for the features that are  
 5 shown on the fifth SEM, do you observe a  
 6 center void or pinhole?  
 7 A. Yeah, of a large central void.  
 8 Q. Okay. Now, could I get you to  
 9 take a look, please, at the third SEM? And  
 10 in the upper right-hand corner on that page,  
 11 it says "No Clean Before E-Less-3."  
 12 MR. BROWN: I think you meant  
 13 left-hand corner.  
 14 MR. MELNIK: I'm sorry. Left-hand  
 15 corner. Thank you.  
 16 THE WITNESS: Yes.  
 17 BY MR. MELNIK:  
 18 Q. And on Exhibit 1000, this would be  
 19 Bates page ST003068, and on the one that you  
 20 are looking at, the Bates page is different  
 21 but --  
 22 A. Yes.  
 23 Q. Okay. And do you have an  
 24 understanding that this SEM corresponds to  
 25 wafer 335?

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Page 162

1 Page No. Line No. Change to:  
 2  
 3 Reason for change:  
 4 Page No. Line No. Change to:  
 5  
 6 Reason for change:  
 7 Page No. Line No. Change to:  
 8  
 9 Reason for change:  
 10 Deposition of Thomas Taylor  
 11  
 12 Page No. Line No. Change to:  
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 14 Reason for change:  
 15 Page No. Line No. Change to:  
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 17 Reason for change:  
 18 Page No. Line No. Change to:  
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 20 Reason for change:  
 21 Page No. Line No. Change to:  
 22  
 23 Reason for change:  
 24 Page No. Line No. Change to:  
 25

Page 163

1 Reason for change:  
 2 Page No. Line No. Change to:  
 3  
 4 Reason for change:  
 5  
 6  
 7 SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
 8 Thomas Taylor.

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**Videotaped Deposition of Thomas Taylor, Vol. II - October 23, 2002**  
**\*\*\* HIGHLY CONFIDENTIAL \*\*\***

Page 158	Page 160
<p>1 STATE OF OREGON )  2 County of Multnomah ) ss.  3 I, Carol Ann Nevarez a Certified  4 Shorthand Reporter for the State of Oregon,  5 do hereby certify that, pursuant to Oregon  6 Rules of Civil Procedure, THOMAS TAYLOR  7 personally appeared before me at the time and  8 place mentioned in the caption herein; that  9 the witness was by me first duly sworn on  10 oath, and examined upon oral interrogatories  11 propounded by counsel; that said examination,  12 together with the testimony of said witness,  13 was taken down by me in stenotype and  14 thereafter reduced to typewriting; and, that  15 the foregoing transcript constitutes a full,  16 true and accurate record of said examination  17 of and testimony by said witness, and of all  18 other proceedings had during the taking of  19 said deposition, and of the whole thereof.  20 Witness my hand at Portland,  21 Oregon, this 28th day of October, 2002.  22  23 Carol Ann Nevarez  24 Certified Shorthand Reporter  25 Certificate No. 94-0303.</p>	<p>1 CERTIFICATE  2 STATE OF  3 COUNTY/CITY OF  4 Before me, this day, personally  5 appeared, Thomas Taylor, who, being duly  6 sworn, states that the foregoing transcript  7 of his/her Deposition, taken in the matter,  8 on the date, and at the time and place set  9 out on the title page hereof, constitutes a  10 true and accurate transcript of said  11 deposition.  12  13 Thomas Taylor  14  15 SUBSCRIBED and SWORN to before me this  16 day of , 2002 in the  17 jurisdiction aforesaid.  18  19 My Commission Expires Notary Public  20  21  22  23  24  25</p>
Page 159	Page 161
<p>1 CAPTION  2 The Deposition of Thomas Taylor,  3 taken in the matter, on the date, and at the  4 time and place set out on the title page  5 hereof.  6 It was requested that the deposition  7 be taken by the reporter and that same be  8 reduced to typewritten form.  9 It was agreed by and between counsel  10 and the parties that the Deponent will read  11 and sign the transcript of said deposition.  12  13  14  15  16  17  18  19  20  21  22  23  24  25</p>	<p>1 DEPOSITION ERRATA SHEET  2  3 RE: Alexander Gallo &amp; Associates  4 File No. 1899  5 Case Caption: Semitool, Inc. vs.  6 Novellus Systems, Inc.  7 Deponent: Thomas Taylor  8 Deposition Date: October 23, 2002  9  10 To the Reporter:  11 I have read the entire transcript of my  12 Deposition taken in the captioned matter or  13 the same has been read to me. I request  14 that the following changes be entered upon  15 the record for the reasons indicated. I  16 have signed my name to the Errata Sheet and  17 the appropriate Certificate and authorize you  18 to attach both to the original transcript.  19  20 Page No. Line No. Change to:  21  22 Reason for change:  23 Page No. Line No. Change to:  24  25 Reason for change:</p>

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believe 89:21 95:13 95:19 98:7 107:21 112:18,20 113:24 120:23 121:1,10 121:22,25 131:17 131:25 135:19 140:10,14 142:19 144:4 145:13,19 146:14 149:11	bringing 83:23 broad 73:4 BROADDUS 63:4 brought 84:7 Brown 64:2 67:19 73:12 74:23 75:18 75:22 76:10 81:14 88:14 89:25 90:21 91:7,19 92:17 94:4 97:18 103:23 105:5 111:17 133:5 135:14,23 137:6 138:1 139:1 139:5 142:11 147:13 150:9 153:12 156:17	155:19 161:5 cases 78:22,23 92:18 109:8,11 117:25 catalytic 132:13 category 123:2 catholic 109:18,19 cell 109:23 center 136:1,4 153:6 155:5,11,11 central 153:7 certain 90:24 certainly 70:17 72:3 73:16 85:5 86:3 111:1 123:3,19 certainty 133:22 Certificate 158:25 160:1 161:17 Certified 62:16 65:4 158:3,24 certify 158:5 cetera 69:18 73:22 108:16 134:1 chagrin 148:19 change 149:4 161:20,22,23,25 162:1,3,4,6,7,9,12 162:14,15,17,18 162:20,21,23,24 163:1,2,4	chemical 124:5 133:14 chemistries 99:12 Chen 77:22 78:9,17 114:6 choose 102:21 chorus 68:1 chose 95:22 Chris 77:21 79:3,7 82:21,22 84:3,22 chronological 65:22 80:23 Chun 85:12 86:11 86:14 89:3 90:23 96:12 145:19 circle 77:9 circumstances 108:1 113:5 123:4 Civil 158:6 Clara 97:3,7,12 clarify 85:17 clean 148:3 151:13 153:11 154:1 clear 67:8 111:11 125:19 clearly 68:21 138:5 close 95:21 Coie 63:6 colleagues 104:5 come 104:2 coming 65:11 comment 156:8 comments 66:19 90:9 Commission 160:19 committing 138:16 common 108:10 116:4 commonly 116:5,7 116:8 communication 89:2 90:23 companies 71:23,24 72:1,10 73:2 compare 118:4 compared 134:20 comparing 155:13 compilation 140:23 complete 67:24 69:18 96:17 completed 145:17 completely 127:13 completing 78:15	components 130:25 compound 91:8 135:14 Comprehensive 72:2 computational 83:10,11 concentrate 75:11 concentrated 75:5 concept 102:3 104:3 106:22 107:5 127:23 130:13 138:24 concepts 133:13 conceptualize 87:25 conceptualized 104:4 conceptually 130:3 concerns 121:8 concert 96:24 concluded 104:16 136:19 156:20 conclusion 88:8 137:5 155:20 156:10 conditions 67:17,18 130:7,20 131:1,6 conduct 71:1 90:24 132:4 144:8 145:16 conducted 69:8,12 70:14 72:22 74:5 74:19 93:15 117:6 117:11 132:20 134:6,7,12 144:10 145:8,10 conducting 71:10 conductive 83:13 132:15,23 conductivity 129:12 130:5 CONFIDENTIAL 62:8 conformal 131:7,22 133:2,8 134:9,17 conformally 131:3 connect 111:14 connected 78:1 91:11 connection 142:2 consequently 138:14 considered 70:1
best 71:20 81:3 86:5 86:8 93:2,21 96:9 127:20,25 128:5 128:11 141:12 better 103:10 125:20 between 66:11 74:7 74:9 89:3 90:23 106:9 107:6 108:8 125:3 126:18 143:21 150:8 159:9 binder 81:17,20 bit 139:8 blanked 110:13,18 blocked 127:13 Bob 73:18 77:24 78:18 82:20 95:14 146:13 body 96:1,2 book 65:20,21 both 78:1 97:3 136:1 152:15,16 161:18 bottom 100:11,15 101:16 115:11,14 115:15 122:21 153:3 box 82:18 144:21 144:25 154:9,11 154:24 boxes 154:17 break 118:15 148:3 149:5 150:14 brief 144:7 briefly 73:23 brighteners 110:4 bring 66:3 84:4	bubble 78:9 bubbles 77:23 78:1 bulk 128:23,25 131:10 134:22 136:9 bullet 129:2 130:18 131:16 133:19 BY-MR.MELNIK 150:19 BY-MR.RIEDIN... 65:9  C CA 63:23 California 64:5 Calispell 63:16 call 90:14 128:23 called 131:4 143:15 calls 127:9 128:3 came 65:19 candidate 132:24 capabilities 69:9 74:22 capability 83:7 capable 130:4 132:12 caption 158:8 159:1 161:5 captioned 161:12 Carol 62:16 158:3 158:23 cascade 68:3 case 93:13 100:9,20 108:11 109:13 110:16 116:19 120:11 135:25 136:4,11,16 152:7	changed 139:10 140:13 changes 78:19 94:22 95:1 161:14 character 147:14 characterization 69:3,11,18 70:15 71:16,22 73:2,14 75:3,20 84:12,16 85:15,18,22 86:1 86:4,7 90:19 91:4 93:24 94:10 107:20 characterize 69:9 71:1 74:5 characterized 74:2 characterizing 74:21 94:8 137:21 charge 120:5 chart 76:25 77:20 78:24 157:4 charts 77:4 check 138:19,23	chemical 124:5 133:14 chemistries 99:12 Chen 77:22 78:9,17 114:6 choose 102:21 chorus 68:1 chose 95:22 Chris 77:21 79:3,7 82:21,22 84:3,22 chronological 65:22 80:23 Chun 85:12 86:11 86:14 89:3 90:23 96:12 145:19 circle 77:9 circumstances 108:1 113:5 123:4 Civil 158:6 Clara 97:3,7,12 clarify 85:17 clean 148:3 151:13 153:11 154:1 clear 67:8 111:11 125:19 clearly 68:21 138:5 close 95:21 Coie 63:6 colleagues 104:5 come 104:2 coming 65:11 comment 156:8 comments 66:19 90:9 Commission 160:19 committing 138:16 common 108:10 116:4 commonly 116:5,7 116:8 communication 89:2 90:23 companies 71:23,24 72:1,10 73:2 compare 118:4 compared 134:20 comparing 155:13 compilation 140:23 complete 67:24 69:18 96:17 completed 145:17 completely 127:13 completing 78:15	components 130:25 compound 91:8 135:14 Comprehensive 72:2 computational 83:10,11 concentrate 75:11 concentrated 75:5 concept 102:3 104:3 106:22 107:5 127:23 130:13 138:24 concepts 133:13 conceptualize 87:25 conceptualized 104:4 conceptually 130:3 concerns 121:8 concert 96:24 concluded 104:16 136:19 156:20 conclusion 88:8 137:5 155:20 156:10 conditions 67:17,18 130:7,20 131:1,6 conduct 71:1 90:24 132:4 144:8 145:16 conducted 69:8,12 70:14 72:22 74:5 74:19 93:15 117:6 117:11 132:20 134:6,7,12 144:10 145:8,10 conducting 71:10 conductive 83:13 132:15,23 conductivity 129:12 130:5 CONFIDENTIAL 62:8 conformal 131:7,22 133:2,8 134:9,17 conformally 131:3 connect 111:14 connected 78:1 91:11 connection 142:2 consequently 138:14 considered 70:1

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A					
<b>ability</b> 79:21 93:3 141:12 <b>able</b> 96:17 110:16 113:23 <b>about</b> 68:15 76:23 80:1 90:9 99:20 101:7,11 103:5 122:24 133:8 135:11 137:23 148:2 149:10,25 151:21 154:14 <b>above</b> 77:9 <b>absolutely</b> 71:4 108:22 119:15 <b>access</b> 105:22 <b>according</b> 154:16 <b>accounting</b> 144:15 145:15 <b>accurate</b> 158:16 160:10 <b>acknowledge</b> 116:9 <b>across</b> 104:3,6 134:2 <b>activity</b> 65:14,16 66:3 <b>actual</b> 68:20 108:24 <b>actually</b> 84:22 97:6 117:5 123:4 127:16 137:8 143:22 144:12,14 145:7 146:3 <b>additives</b> 110:4 <b>address</b> 148:25 <b>administrator</b> 147:4 <b>advance</b> 89:12,14 132:18 <b>Advanced</b> 76:25 77:13 78:21 79:13 80:6 94:18 95:7 112:6 113:1,11 115:19 119:25 120:15 121:24 126:12 146:17,19 <b>aforesaid</b> 160:17 <b>after</b> 95:25 99:18 104:25 125:13 126:1 128:19 <b>afternoon</b> 149:24 <b>again</b> 89:23 97:18 103:8 123:3 125:20 130:22	140:11 <b>agenda</b> 112:5,10 119:21 120:7 157:7,8 <b>agendas</b> 112:6 119:23 <b>agree</b> 98:11 137:5 <b>agreed</b> 97:23,25 98:13 159:9 <b>ahead</b> 128:1 <b>aid</b> 149:15 <b>Alexander</b> 161:3 <b>allocate</b> 71:11 <b>allow</b> 89:22 130:14 131:7 <b>alone</b> 142:13,17 <b>along</b> 66:20 <b>already</b> 134:15 <b>alternately</b> 109:18 <b>alternative</b> 129:10 <b>alternatively</b> 125:11 134:16 147:1 <b>ambiguous</b> 103:14 103:22 <b>AMD</b> 72:3,10 <b>ameliorate</b> 104:20 <b>among</b> 70:15 <b>amount</b> 106:16,20 106:23 134:20 <b>amps</b> 109:22,22 <b>analysis</b> 72:23 <b>analyzing</b> 71:8 88:7 <b>anatomic</b> 127:11 <b>Angeles</b> 63:23 <b>angstroms</b> 106:9,9 107:4,12,12,13,22 107:23 124:19 125:1,3 126:18 128:7,14 140:15 140:15 <b>anisotropic</b> 124:6 <b>anisotropically</b> 131:8 <b>Ann</b> 62:16 158:3,23 <b>anode</b> 74:8,9 <b>anode/cathode</b> 70:6 <b>anode/diffuser</b> 70:7 <b>anodic</b> 109:18 <b>another</b> 65:11 92:11 94:20 96:4 111:13 135:9 139:14 151:2	<b>answer</b> 67:22,24 69:5 75:25 87:17 93:2 103:2 126:9 134:25 135:5,19 <b>answered</b> 92:16 105:5 127:10 128:3 133:5 <b>answering</b> 81:16 <b>answers</b> 79:9 <b>anticipate</b> 107:2 <b>anticipated</b> 125:4 126:6 128:8 <b>anticipating</b> 125:18 <b>anyone</b> 73:10 104:10 113:17 114:4,8,10 115:23 129:21 133:3 143:6 145:11 146:16 149:22 <b>anything</b> 69:4 88:6 89:19 95:15 96:25 125:24 143:17 149:18 <b>anywhere</b> 98:6 <b>appear</b> 68:7 78:10 139:21 142:1 155:21 <b>APPEARANCES</b> 63:1 <b>appeared</b> 158:7 160:5 <b>appears</b> 76:24 82:19 89:4 90:2 110:12,15 137:15 152:24 <b>application</b> 83:8 <b>applications</b> 84:21 <b>applied</b> 64:1 66:5 66:11,13 131:1 132:10 147:10,11 148:13,16 <b>appraisals</b> 78:15 <b>appreciate</b> 65:12 <b>approaches</b> 88:2 <b>appropriate</b> 161:17 <b>appropriately</b> 132:11,13 <b>approximately</b> 108:11,14 <b>April</b> 66:14,16,18 77:8,12,18 78:13 79:4 82:12,14,17 84:12,17 120:3,17	120:25 121:18,21 122:22 123:8,13 126:7 131:19 133:3 <b>area</b> 79:13 <b>argue</b> 156:10 <b>arise</b> 75:16 <b>around</b> 154:9 <b>articulate</b> 67:23 68:2 <b>aside</b> 78:11 79:9 <b>asked</b> 84:1 92:15 105:5,12,17 127:10 128:3 133:5 135:8,11 138:14 <b>asking</b> 81:13 93:8 125:17,19 <b>aspect</b> 77:17 <b>assessment</b> 132:21 137:9 <b>associated</b> 101:23 104:17 133:12 143:14 <b>Associates</b> 161:3 <b>assuming</b> 141:6 <b>ATG</b> 65:23 95:10 <b>attach</b> 161:18 <b>attempt</b> 86:21,22 87:3,5,10,22 103:10 <b>attempting</b> 71:20 86:4,8,11,25 137:11 <b>attempts</b> 87:14 <b>attendees</b> 113:19 <b>attending</b> 148:18 <b>attribute</b> 122:19 <b>attributes</b> 132:2,7 146:2 <b>augmenting</b> 103:11 <b>author</b> 116:10 <b>authored</b> 141:2 <b>authorize</b> 161:17 <b>availability</b> 72:19 73:21 <b>available</b> 80:21 81:24 128:15 146:18,20,21,24 147:2 <b>Avenue</b> 62:13 63:7 63:21 <b>avoid</b> 87:11,23	<b>aware</b> 149:9,14 <b>a.m</b> 62:12 156:21  <th>B</th> <b>back</b> 65:11 87:15,17 92:3 102:9 105:18 105:24 114:12 118:2 126:7 131:15 134:24 140:11 147:20 151:7 154:7 <b>bad</b> 147:11 <b>barrier</b> 111:11 112:22 121:7 129:13 130:15 132:23 <b>based</b> 153:2 <b>Basic</b> 110:2 <b>basis</b> 94:9 155:19 <b>Bates</b> 90:2 151:5,24 153:19,20 <b>bath</b> 109:25 110:2,3 129:24 130:1,3,3 130:6,8,12 143:15 143:15 <b>baths</b> 109:24 132:12 143:24,25 <b>Batz</b> 73:18 77:24 78:18 <b>bear</b> 90:1 <b>bearing</b> 66:25 <b>become</b> 101:16 <b>before</b> 66:2 67:2,22 76:20 81:16 82:9 87:2 95:25 104:5 104:10,11 110:10 110:20 112:7 118:21,23 119:24 123:8 133:3 135:11 138:16 139:7 141:13 153:11 154:2 158:7 160:4,15 <b>begin</b> 66:12,21 <b>beginning</b> 80:3 102:19 105:9 120:3 <b>begins</b> 97:23 102:11 <b>being</b> 79:18,22 96:24 100:18 123:16 137:15 138:12 147:21 160:5	B

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143:11,14 150:5 documents 65:14,19 66:23 80:19,24 81:10,19 116:5 119:16 126:15 140:24 141:9,23 149:9,14 150:2,5 DOE 78:6 doing 84:11 87:2,8 103:11 132:25 done 99:24 113:8 144:12,14 down 67:21 68:3 75:9 76:8 83:1 84:7 97:22 99:15 127:11 136:14 158:13 downtown 148:8 dozens 147:17 Dr 77:22 78:9,17 114:6 151:3 Drive 63:15 due 101:25 duly 65:4 158:9 160:5 during 70:18 78:20 80:15 90:5 94:23 98:14 146:25 151:3 158:18 dynamics 83:11	134:14 145:16 146:24 147:3 electric 83:12 electrochemical 66:10 electroless 86:23 87:1,1 101:5,8 102:18 103:12,19 106:6,7,25 116:20 117:4 125:9 126:17 127:14 128:18,19 129:7 131:15,18 132:7 132:12,15,24 134:8,14 136:6,20 137:2 138:21 140:9 152:9 154:2 155:2,14 156:1 electrolyte 74:6 83:14 130:23 131:6 Electrolyte/Plating 130:20 electrolytic 79:22 86:23 87:2,4 102:20 106:14 123:12,16 124:6 128:21 131:13 155:3 electronic 96:19 electroplating 70:16 71:2,2 94:18 95:4 125:12 129:11,23 130:19 131:12 152:11 eliminate 87:5 emphasizing 86:13 employed 66:5 99:13 144:8,16 employing 130:7 employment 66:13 105:1,21 encountered 71:10 end 65:17 67:11 80:3 82:14,16 105:8 107:21 endorsed 103:9 engaging 83:7 engineering 79:18 engineers 71:9 85:6 enhance 137:3 enhanced 130:12 155:2	enhancement 123:24 124:1,12 125:22 126:1,11 126:20 127:19,23 129:2 138:21 149:12,17 155:15 156:1 enough 139:4 entered 161:14 entire 145:21 161:11 entirely 132:17 entitled 89:1 111:10 123:23 124:12 142:23 enumerated 110:1 Errata 161:1,16 Esquire 63:3,4,5,13 63:19 64:2 estimates 126:3 et 69:18 73:22 108:16 133:25 evaluate 94:6 107:24 116:19 117:3 evaluated 99:14 evaluating 86:20 even 79:16 94:25 106:22 event 137:14 141:20 141:21 eventual 138:9 ever 79:2 evolution 96:15 138:9 evolve 91:16,20 exact 70:20 148:24 exactly 69:5,7,21 94:24 100:19 105:2,20 107:17 123:18 126:5 146:9 150:1 examination 65:8 150:18 158:11,16 examined 65:6 70:23 158:10 example 100:22 105:4 132:20 135:15 138:4 except 121:11 excessive 134:18 excessively 138:13 exchange 150:4	exchanged 147:18 exclude 114:4 exclusively 77:15 excuse 78:4 82:22 83:16 97:5 108:8 136:24 149:23 150:1 executed 96:14 execution 117:13 exhibit 67:3 68:14 68:23 69:2,10,15 70:9 73:25 74:15 76:6,18,21 78:11 79:11 80:4 82:1,7 82:9,11,19 84:2 85:21,23 88:9,18 88:20,21,23,25 89:1,5,7,10,17,20 90:3,15,18,20 91:4,16,17,24 92:8,12,14,20,24 93:4,6,9,10,18,19 93:24 94:12 96:3 96:7,11 98:6,23 99:2,5,16 100:1,8 101:2 102:10 106:1,24 107:9 108:25 110:7,9,11 110:24 111:14,16 111:22,24 112:3 112:21 113:3,15 113:20,25 114:2 114:12,15,25 115:1,2,2,4,11,15 115:18 116:2,11 117:14 118:2,4,4 118:10 119:1,8,9 121:2,3,5,6,9,12 121:20 125:24 126:12,21 131:3 135:8,11,12,22 136:25 137:24 138:4,8 139:7,10 139:13,15,16,19 139:24 140:3,17 140:17,20,22,23 141:9 142:1,9,18 142:20,22 143:18 144:1,5,23,24 145:22 146:8 147:5,8,20,23,25 150:22 153:18 157:2	exhibits 118:20 126:16 157:1 Exhibit-1053 112:17 Exhibit-50 66:25 Exhibit-51 76:15 Exhibit-52 82:3 Exhibit-53 88:13 Exhibit-54 111:19 Exhibit-55 118:22 Exhibit-56 119:3 Exhibit-57 119:5 existing 87:4 122:9 expected 125:25 140:13 expended 79:18 experience 83:17 experiencing 72:17 experiment 89:1 92:22,25 93:13 98:9,10 99:25 100:3,5,6 102:3,4 102:11,16 106:2,2 107:11,16 108:6,8 108:13,24 113:2 113:22 114:13,14 114:17,19,22 117:10,13 135:16 137:9,25 138:3,5 138:7,10,11,24 139:10 140:1,7 143:20,20 144:1 145:1,3,10 155:24 156:1,2 experimental 74:5 90:10 92:4,25 104:15 108:21 137:4 142:23 143:5 147:22,24 experimentation 72:18,22,24 145:17 experiments 69:3,8 69:11,17,20 70:14 70:18 71:1,7,17 71:19,23 72:4,5 73:3,15,22 74:3 74:14,20 75:21 84:12 85:16,19,22 86:1,4,7 87:1,2 87:24 88:3 90:19 90:25 91:3,11,12 91:15 92:8,9,13
--	---	---	--	--

## E

each 73:1 94:24  
108:18 143:14  
earlier 79:9 87:7  
98:16 118:24,25  
122:19,24  
Early 130:21  
ECD 77:21 78:7  
94:20 151:18  
152:1,3,5,12  
154:2,5  
effect 68:21 69:6  
efficient 74:4  
effort 91:13  
efforts 79:18  
eight 144:18  
eighth 63:8 144:4  
either 74:11,14 80:4  
95:16 102:22  
104:4 107:22  
113:19 114:25  
125:9 129:12

70:16 71:2,2  
94:18 95:4 125:12  
129:11,23 130:19  
131:12 152:11  
eliminate 87:5  
emphasizing 86:13  
employed 66:5  
99:13 144:8,16  
employing 130:7  
employment 66:13  
105:1,21  
encountered 71:10  
end 65:17 67:11  
80:3 82:14,16  
105:8 107:21  
endorsed 103:9  
engaging 83:7  
engineering 79:18  
engineers 71:9 85:6  
enhance 137:3  
enhanced 130:12  
155:2

141:21  
eventual 138:9  
ever 79:2  
evolution 96:15  
138:9  
evolve 91:16,20  
exact 70:20 148:24  
exactly 69:5,7,21  
94:24 100:19  
105:2,20 107:17  
123:18 126:5  
146:9 150:1  
examination 65:8  
150:18 158:11,16  
examined 65:6  
70:23 158:10  
example 100:22  
105:4 132:20  
135:15 138:4  
except 121:11  
excessive 134:18  
excessively 138:13  
exchange 150:4

111:22,24 112:3  
112:21 113:3,15  
113:20,25 114:2  
114:12,15,25  
115:1,2,2,4,11,15  
115:18 116:2,11  
117:14 118:2,4,4  
118:10 119:1,8,9  
121:2,3,5,6,9,12  
121:20 125:24  
126:12,21 131:3  
135:8,11,12,22  
136:25 137:24  
138:4,8 139:7,10  
139:13,15,16,19  
139:24 140:3,17  
140:17,20,22,23  
141:9 142:1,9,18  
142:20,22 143:18  
144:1,5,23,24  
145:22 146:8  
147:5,8,20,23,25  
150:22 153:18  
157:2

143:20,20 144:1  
145:1,3,10 155:24  
156:1,2  
experimental 74:5  
90:10 92:4,25  
104:15 108:21  
137:4 142:23  
143:5 147:22,24  
experimentation  
72:18,22,24  
145:17  
experiments 69:3,8  
69:11,17,20 70:14  
70:18 71:1,7,17  
71:19,23 72:4,5  
73:3,15,22 74:3  
74:14,20 75:21  
84:12 85:16,19,22  
86:1,4,7 87:1,2  
87:24 88:3 90:19  
90:25 91:3,11,12  
91:15 92:8,9,13

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72:17 127:22 145:4 constitutes 158:15 160:9 consult 99:22 contact 73:1,6,11 73:17 145:20 contacts 73:8 contained 114:19 containing 83:13 contemplate 128:20 contemporaneous 76:2 context 80:24 81:12 81:20 133:11 continuation 92:12- 92:14 continuing 81:4 continuous 86:19 136:21 continuously 132:14 control 128:9 conversation 98:19 98:19 103:13 conversations 118:24 convey 127:17 copied 141:16 copies 151:3 copper 70:16 71:2 71:17 86:24 94:7 96:16 101:9 102:18 103:19 106:8 110:3 116:20 117:4 121:8 122:11 125:9,10 127:14 134:8,14 140:9 copy 110:8,17 135:9 139:12,14 150:21 151:2 Core 78:7 corner 77:8 117:15 121:13 152:2 153:10,13,15 corporate 63:12 79:1 correct 89:18 93:17 99:19 100:20,23 106:4 108:19,23 114:22 120:22 124:13 125:7	138:24 150:1,10 correctly 138:15 correspond 143:17 143:25 147:23 corresponds 153:24 counsel 63:2,12,18 64:1 147:10 158:11 159:9 count 108:22 counted 108:20,24 County 158:2 COUNTY/CITY 160:3 couple 107:3 148:4 149:8 course 70:22 81:22 court 62:1 66:24 67:20 76:17 82:6 88:17 111:21 118:19 Cover 141:25 coverage 100:7,8,9 100:13 101:4 covered 100:18 130:16 created 134:8 criteria 72:15 critical 70:2 cross 63:13 85:7 cross-sections 86:17 96:14 current 109:13,16 109:22 131:1 132:10 148:9,11 148:24 currently 66:4 72:16 148:5 customer 77:24 78:7 104:15 customers 73:20 cut 114:23 115:8 117:22 118:6 CVD 116:22 117:4 117:23 122:13 125:10 130:17  <b>D</b> D 63:4 date 66:15 68:9,12 70:10,11 77:7 102:22 105:1,21 105:24 117:15,24 118:11,12 121:17	133:4,20 144:17 159:3 160:8 161:8 163:7 dated 78:24 day 66:18 158:21 160:4,16 DC 109:12,13 dealing 72:8 deals 124:12,13 decide 70:8 deciding 138:20 deemed 134:13 138:12 Defendant 62:6 63:18 64:1 define 98:12,13 99:4 defined 98:1,24 99:1 definition 90:16 degree 129:12 133:21 demo 77:24 104:15 104:21 demonstration 138:15 Demos 78:7 Dennis 64:9 density 131:1 depart 82:23 departing 82:24 departmental 147:3 Deponent 159:10 161:7 deposit 129:14 131:7,21 132:22 134:14 154:5 deposited 122:19 127:13 131:2,8 134:18,20 136:8 depositing 132:13 132:17 133:2 deposition 62:9 65:1 66:10 85:12 86:24 87:2 89:11 89:13,15 90:6 96:16 101:5,7,8 102:19 103:20 105:13 106:6,8 107:2,3 121:8 122:10,11,12 123:12,16 124:6 128:20,21 131:10	132:7 134:8,22 135:7 136:10 139:15 149:19,21 150:7 151:4 152:9 156:20 158:19 159:2,6,11 160:7 160:11 161:1,8,12 162:10 depositions 129:8 depth 69:24 describe 65:14 92:13 98:8,23,25 100:2,5 137:25 138:9 144:22 described 85:22 90:20 91:3,5,16 91:17 92:23,25 93:4,6,19,23 98:5 98:16 109:7 112:21 113:3 120:4 122:18 125:23 126:20 127:23 135:13,17 143:18 145:7 describes 142:24 describing 90:24 102:2 126:10 description 144:12 144:14 157:1,2 design 83:8 84:21 92:25 107:16 138:6 143:20 designing 71:7 88:3 designs 108:21 desirable 79:22 desired 72:18 detailed 79:18 85:3 details 72:19,21 determine 83:12 87:10,14,22 91:2 101:3 133:11 determining 83:18 86:15 develop 112:12 developing 96:22 development 68:22 68:25 71:15 78:8 95:20 111:12 112:23 120:5,21 120:24 149:12,16 differences 143:21 different 86:20 88:2 118:9 133:8	135:20 140:24,24 151:4,25 153:20 155:9 difficulty 117:9 diffuser 74:10 dimension 154:24 dimensions 154:12 direct 73:19 91:11 109:13 120:14 directing 78:15 directly 78:13 79:6 102:12 Director 66:8 95:23 discontinuities 129:4,10 discontinuous 101:17,19,25 108:2 133:13 134:16 discreet 96:18 discussed 92:8 97:10 98:17 102:7 112:24 123:16 134:3 147:25 discussing 71:9 73:21 88:1 102:3 104:9 133:1 discussion 81:4 83:6 84:20 124:11 discussions 85:4,5,7 85:14 86:11 103:4 103:16 104:13,19 104:23 122:23 123:7 133:15,22 display 96:18 disseminate 113:10 disseminated 113:6 113:7,21 distributed 120:14 126:14 distribution 83:12 DISTRICT 62:1,1 division 78:22 94:20 document 66:22,25 71:7 75:2 76:4,14 76:18 81:2,8 82:2 82:7 88:12,18 89:17 90:18 92:1 99:22 111:18,22 115:18,24 117:18 119:2,3,6,21 141:6,8 142:10,16
---	--	---	---	---

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hundreds 119:16	indicate 68:14 75:3	107:24 114:4	<b>K</b>	125:1,2,5,15,22
<b>I</b>	indicated 99:10	130:14 131:5	Kalispell 82:24 97:3	125:25 126:11,20
idea 84:14 90:16	135:19 136:5	155:4	97:8,12	127:19,23 129:1,4
103:9	161:15	interacting 72:9	kind 76:24 77:4	129:9,13 130:12
identification 76:15	indicating 117:23	interested 83:18	101:20 116:6	130:17,17 131:9
82:3 88:13 111:19	indistinguishable	102:21	126:11	131:10,22 132:1,8
identified 78:4	101:18	interfacing 73:20	kinds 85:21 135:21	133:2 134:9,15,17
79:21 92:19,21	individual 133:21	intermittently	knew 106:25 130:23	136:21 137:3
99:10 125:16	individuals 73:18	101:16	know 65:20 67:7,20	138:21 140:10,12
143:25 152:13	78:16 80:6 85:11	interrogatories	79:20,25 95:5	149:12,17 155:1
identify 72:15 74:1	114:6 120:11	158:10	96:5 102:6 105:12	layers 71:17,18,21
86:12,18 113:24	133:20 134:1	introduced 146:4	105:15 109:8,11	74:16,17,21 75:4
118:23 141:4,8	influence 86:12	involve 71:23 74:16	109:21 113:6	75:16 76:3 77:14
identifying 88:4	information 84:15	74:17,20 85:15,21	116:3 117:7,25	77:16,19 86:2,5
II 62:11 65:1	112:25 113:6,22	85:25	118:13 126:8	86:19,21 102:1,18
immediate 72:7	113:25 146:23	involved 65:15 72:3	129:20,22 130:23	103:19 116:21,23
immediately 102:22	initial 96:16 124:18	78:17 80:7 85:8	131:23 143:1,3,6	117:5 123:8 133:3
immersed 74:8,9	124:25 129:4,9	85:10 86:3 133:20	144:2,20 145:6,18	133:9,13,15 134:9
impact 69:25	130:16	133:22	146:6,11 151:22	147:11
123:11,15 131:2	initially 75:5,11	involvement 93:16	knowledge 98:3	lead 69:17 70:14
impediments 71:9	inlaid 100:12,20	involving 145:10	<b>L</b>	73:19
imply 92:22 124:23	106:12 122:21	Irell 63:20	Lab 77:24 78:6	leader 120:9,10,17
important 70:1	inorganic 130:24	issued 70:11	labeled 98:9 151:18	120:20
86:14	input 70:5 86:15	122:15	152:1,20	leaders 120:9
improve 131:18,20	94:7	iterations 94:25	lack 135:21,21	leading 134:21
131:23 132:1,8	insights 133:25	LD 152:8	large 138:13,16	learning 126:5
improved 101:4	insofar 74:17	<b>J</b>	153:7 155:5	least 67:8 79:5
134:9 137:12	instance 104:7	Jeff 73:19 77:24	larger 137:13,17,21	117:19 121:14
155:15	insufficient 106:11	78:18 82:23	137:22,23 155:22	154:16
improvement	insufficiently 70:4	104:14	156:6,9,11	left-hand 152:2
101:20 156:6	integration 121:8	JERRY 63:3	last 73:24 74:15	153:13,14 154:13
improvements	Intel 66:11 72:3,10	Jin 85:13,15	87:17 89:9,11,13	legible 121:14
146:1	82:12,14,16 83:2	job 68:20 95:22	89:15 105:13	less 128:14 129:3,9
inaccurate 89:21	83:6,21,24 84:8	Johnson 150:22	111:5,6,8,9	let 67:21,23 87:14
90:8,12	84:16,20,25 85:1	155:20	115:17 121:14,16	89:25 97:18
inadequate 104:22	85:6,9 86:5,8,16	Join 74:24 91:9	126:4 135:7	125:20 132:11
inartfully 92:6	87:25 88:5 89:3	94:4 103:23 133:6	145:22 146:7	LETI 116:24 117:5
Inc 62:2,6 63:14	93:20 96:12 97:16	135:24 137:7	lasted 94:25	117:9
161:5,6	102:5 103:5,9	Joined 75:23	later 75:17 102:22	let's 88:9 110:6
include 100:24	107:18 114:9	Jose 82:20,24 83:2	latter 67:6 136:11	111:13 114:12
113:13	116:22 138:12	Jouno 64:9	layer 74:18,21 77:9	118:14 119:8
included 78:3,7	144:10,15 145:15	JR 63:13	79:12,16,19,22	123:21 131:15
107:15	145:18 147:18	June 80:3	80:8,10 86:14,17	144:3 147:5 149:4
includes 78:2,8	Intel's 83:7 93:15	jurisdiction 160:17	87:4 100:11 101:4	levellers 110:5
including 112:10	138:20	just 66:3 67:4,19	101:10,12,15	like 65:13,18,24
141:25	intend 135:10	78:16 87:9 89:25	103:11 104:18	66:3,21 75:1
incompletely	148:20,22	102:14 105:11	107:9,10 108:2	83:20 97:22
130:16	intended 69:17 74:3	110:8 135:1,13,17	111:11 112:12,23	105:24 118:3
increase 98:3	94:6 98:3 101:6	148:2 149:8	117:24 120:21,24	119:24 140:16
independent 106:13	106:3,7 122:6,8	150:14 151:8	121:7 122:3,5	148:24 151:7
independently	130:2	justified 132:3	123:23 124:4,8,9	155:11
104:4 106:13	intent 100:4		124:12,15,18,24	likelihood 101:14
	intention 99:11			limitations 104:17

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92:14,19,23 93:3 93:5,9,10,14,18 93:20,23,24 94:5 94:10 98:2,5,12 98:14,24,25 99:4 101:15 111:10 112:20 117:3 132:4 134:6,12 142:24 144:7,9,22 expertise 83:19 Expires 160:19 explain 90:10 explicit 99:8 explicitly 75:5,11 92:2 102:7 113:20 152:13 explore 131:5 132:4 exposed 132:23 expressed 100:14 expressing 92:6 extending 110:3 extension 93:5 extent 79:5 external 77:23 78:5 extraordinarily 103:7 extremely 99:8 E-Less-3 153:11 E-Tech 148:16	154:25 155:6,17 features 152:23 153:4 feel 80:25 81:1 few 66:19 150:14 field 77:23,23 78:4 78:5 83:12 fifth 123:22 124:11 125:23 126:21 151:17,23 152:17 152:19 153:5 file 65:23 161:4 fill 71:21 86:5,8,13 86:21 94:7 101:22 103:10 106:12 128:23,25 131:4 155:3,16 filled 137:13 film 70:24 74:10 96:21 98:15 129:8 130:21 131:2,22 132:22 136:6 films 75:7,13 107:25 122:20 128:13 131:8,9 final 67:12 70:2 98:8 112:17 118:10 126:6 find 66:1 105:23 110:17 fine 81:19 finish 67:22 97:19 finished 74:12,13 148:2 first 65:3 67:7 69:14,15,16 74:2 76:23 78:11 79:11 80:2,12,13 85:2 89:5 96:1,2,3,11 100:2 101:2 102:9 102:11 103:17,25 104:7 105:25 109:12 121:11 123:16,19 124:17 131:16 137:1 139:22 141:10,11 141:14 142:2,12 144:21 158:9 five 126:4,12 138:18 143:12,22 143:24 144:24 155:7,12 Floor 63:8	flow 70:5 74:7 fluid 83:11 flux 79:1 83:13 focus 120:12,15 156:7 focusing 66:9 foil 124:2 foils 84:4,7 121:20 121:23 133:17 following 141:16 142:3 161:14 follows 65:7 Fools 66:18 foregoing 158:15 160:6 form 99:1 118:7 131:9 159:8 format 85:5 112:2 119:19 formats 119:24 former 136:4 formulated 132:12 formulation 130:7 130:24 131:6 FORTINO 63:5 Forty 63:8 forward 109:15,15 109:20 138:20 foundation 66:4 138:1 four 83:1 98:22 99:2 137:3 143:9 fourth 102:10 105:25 118:3 119:14 123:22 four-page 88:18 fractional 74:3 frame 105:7 123:20 133:16,18 free 81:1 frequently 128:24 132:16 Friday 141:17 from 65:20 78:11 79:9 91:16,20 92:3 96:16 100:11 101:18 110:1 113:22 115:8 116:22,24,25 117:5,9,13 120:13 122:20 140:15 141:16 142:12 146:4 147:2,2,3	front 88:20 111:24 113:14 114:2 123:5 135:9 146:25 Fujitsu 72:5,10 full 95:1 154:5 158:15 function 134:10 functioning 71:14 further 150:11 156:14,15 FWD 109:15	groups 108:9,10 141:5 Growth 130:21 guess 119:14 123:21 143:12
				H
				half 80:2 85:2 hand 110:7 158:20 handed 110:8 111:3 handing 139:12 handwriting 68:12 109:2,7 116:16 121:17 handwritten 109:1 116:12,13 121:12 121:15 hard 67:23 Hardware 146:6 HARRY 63:13 Haugan 77:21 79:3 79:3,7 82:21,22 84:3,11,15,22 having 65:3 67:9,14 76:19 79:2,6 82:8 88:19 92:2 98:13 99:24 101:18 102:6 103:8 104:5 111:5,23 113:8 115:21 117:12 119:2,3,6 123:4,7 126:14 129:17 134:2 142:13 headed 114:13 122:3 heading 112:10 120:8 137:1 heard 103:17,25 help 80:24 149:11 helping 71:11 hereof 159:5 160:9 high 107:21 151:2,8 higher 151:5 highlight 145:25 HIGHLY 62:8 Hillsboro 148:16 him 67:22,23 81:18 81:20 97:19 his/her 160:7 Hopefully 66:17 hosting 96:4 97:14 hours 149:25 hundred 107:4
			G	
			Gallo 161:3 gave 120:23 134:25 general 73:24 generalized 83:19 generated 133:17 Generation 146:7 gentleman 85:13 gentlemen 66:23 give 67:4 136:9 151:1 given 143:7 giving 139:4 go 65:14 76:4 81:3 88:9 102:9 105:24 107:8 108:25 110:6 114:12 115:17 118:2 128:1 131:15 135:10 139:7 140:11 141:13 147:5,20 going 65:19 66:2 81:11,17 83:1 110:7 124:16 146:1,3 151:1 154:7 gone 105:18 Gotshal 64:3 great 68:1 group 65:23 76:25 77:14 78:21 79:13 80:7 94:14,15,16 94:19 95:2,3,6,7,9 95:12,17 112:6,7 113:1,11 114:5 115:19 119:25 120:15 121:24 126:13 146:17,19 147:1	
F				
face-to-face 134:2 facility 148:13,15 fact 67:10 70:13 75:4 104:1,2,12 105:16 109:21 124:22 134:17 149:16 152:12 factorial 74:3 factors 86:12 fair 156:7 falls 123:2 familiar 65:21 114:6 147:16 fascinating 96:4 fashion 73:24 faster 76:12 faults 133:12 fax 141:16 157:6 feasibility 138:15 138:19,23 feature 127:13 152:22 154:8,14				

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numbered 144:9	152:4 153:1,8,23	104:3,6 113:24	160:9 161:20,23	perhaps 65:25
numbers 67:1,16	154:7	114:1 115:7,8	162:1,4,7,12,15	80:17,24 84:7
76:19 82:8 88:19	once 89:23	118:6,7 122:25	162:18,21,24	92:7 107:7 111:14
119:2,4,6 151:25	one 66:22 67:19	126:24 127:1,3	163:2	period 70:18 78:20
<b>O</b>	73:5,7,16 74:14	134:1 141:23	paged 111:22	78:23 79:14,20
oath 65:4 158:10	78:2,25 79:8	142:14,18 146:18	pages 67:6,12 73:25	80:2,15 94:23
object 81:14 139:1	87:22 88:11 92:11	158:18	74:15 98:22 99:1	95:13,21,25
objection 92:15	94:17,19 95:16	otherwise 84:17	99:5,16 111:1,2	145:21 146:4
94:2 103:21 127:9	97:4,7,8 107:7	130:9,10	116:2 121:11,14	149:25
128:3	108:12,13 110:3	out 75:1 80:25	141:7,25 142:3,14	periods 78:25
objections 68:2	115:7 118:6	110:13,18 147:9	142:18 143:9,10	Perkins 63:6
observation 101:14	119:18 122:4,23	147:17 148:10,12	143:12,22	person 79:4 99:23
observations 90:10	132:19 141:6	148:15 159:4	paper 141:5	119:14
136:1 147:22,24	146:25 147:6,21	160:9	paragraph 69:15	personal 87:13,21
observe 152:19	151:2,7 152:20	outcome 72:18	84:2 97:23 102:10	personally 84:25
153:5	153:19 154:1,3	outside 129:21	102:11 105:25	158:7 160:4
observed 87:6,12	ones 67:7 72:6 78:3	over 65:14,19 66:2	parameters 70:2,5	persons 113:24
104:16 136:12,18	137:18 151:18	70:21 92:9 107:6	70:23 74:6 86:20	pertains 118:1
obtained 92:3 114:9	156:12,12	135:10 146:4	88:1 92:20 94:7	pertinent 124:21
116:22,23,24	one-minute 150:14	overlay 96:20	99:13 108:10	photographs 97:10
117:5	one-page 82:7	overseeing 120:12	Parkway 64:4	147:18,23
obtaining 117:9	only 70:10 72:6	<b>P</b>	parsing 108:8	photos 96:18
obviously 84:18	81:5 90:8 96:18	packet 111:3	part 68:23 75:20	phrase 85:20
Occasionally 73:18	103:16 128:8	page 68:7 69:15	84:11 93:8 95:6	131:11
112:8	133:20 140:7	74:2 76:23 78:11	143:23	pinch 136:6,9
occur 97:1	144:24 150:5,9	78:13 79:11 82:19	partial 69:23	pinhole 137:14
occurred 87:23	151:19 152:1,3,5	89:5 96:1,2 98:8	particular 70:20	153:6
occurring 141:20	152:12	98:23 100:1 102:9	79:14 81:6,8,18	place 67:2 78:20
141:22	opposed 106:16	106:1 107:8	96:13 100:20	94:23 97:4,15
occurs 92:7	optimization 70:15	108:18,25 110:13	107:14,15 116:19	104:24 107:6
October 62:12 65:2	122:3,5,7,8	111:4,5,6,8,9	117:10 120:10	112:22 133:16
68:15,19 70:11	optimized 122:11	112:17 114:2,13	133:19 137:22	158:8 159:4 160:8
91:5,13,17 92:4	130:20	114:15,20 115:6,7	152:7	placed 118:20
158:21 161:8	optimizing 75:6,9	115:11,14,15,17	particularly 67:25	Plaintiff 62:3 63:2
off 118:17 136:6,9	75:11	116:11,14 117:14	73:20 76:10 95:4	63:12
137:15 149:6	oral 158:10	117:17,19 118:3,4	parties 159:10	plan 138:17 144:11
150:17	order 80:23 106:17	118:5,10,12 119:1	parts 91:4	plans 92:4 148:9,11
offered 155:20	107:3	121:12 122:2,3,4	paste 114:24 117:22	148:23
office 149:25	Oregon 62:1,14,16	122:16 123:22,22	118:6	plastics 132:20
off-line 81:3	148:5,10,12 149:2	124:11,11 125:23	pasted 115:8	plated 70:24 74:10
Often 67:23	158:1,4,5,21	126:12,21 127:18	PAUL 63:5	74:18 75:7,13
Oh 104:12	organic 130:25	127:19,24 129:1,2	peer 133:24	plating 69:3,9 70:3
okay 71:13 76:4	organization 76:24	136:25 139:22	peers 123:5	74:19 75:14 83:20
77:17 79:3 80:1	77:4,20 146:15	140:2 141:10,11	people 72:9 76:11	86:18,20 96:16,17
80:17 83:15 86:6	organizational	141:14,24,25	78:12,14 79:10	101:17 102:20
93:17 98:11 99:3	78:24 94:22 157:4	142:2,4,4,9,10,12	85:9 95:3 102:4	104:18,21 109:16
113:23 118:2,10	original 161:18	142:20,22 143:14	103:5 113:13	109:23 130:25
118:16 122:15	originally 140:1	143:21 144:3,4,18	114:1 122:25	131:6 132:19
123:14 131:11	141:17	144:21 145:2,7,11	per 75:4 107:4	133:12 137:2
134:5 139:5 141:4	originals 65:24	145:22 146:7	131:24	please 76:6,8 83:16
144:18 147:5,7	other 70:16 71:23	151:21 153:10,19	performance 78:15	85:17 87:17 88:11
150:20,23 151:16	71:24 72:10 78:23	153:20 159:4	132:1,8	89:24 97:5 108:7
	79:10 100:23		performed 72:4,5	111:16 115:5

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<b>limited</b> 134:11 <b>line</b> 96:3,6,11 100:2 100:5 101:2 107:10 108:3 109:12,24 141:15 161:20,23 162:1,4 162:7,12,15,18,21 162:24 163:2 <b>lines</b> 66:20 <b>list</b> 72:2 111:9 112:9 119:12 <b>listed</b> 67:11 78:12 79:11 108:18 113:14 114:1 119:11 154:12 <b>literally</b> 119:16 <b>little</b> 139:8 <b>live</b> 148:5,7,8 <b>LLP</b> 63:6,20 64:3 <b>locations</b> 115:4 <b>logistics</b> 72:18 73:21 <b>long</b> 94:24 <b>look</b> 65:24 69:14 80:18,25 82:18 99:25 104:21 105:18 118:3 121:2 136:24,25 140:11,16 151:11 151:17 153:9 <b>looked</b> 89:16 <b>looking</b> 101:21,22 127:20 153:20 <b>looks</b> 119:15 <b>Los</b> 63:23 <b>loving</b> 90:9 <b>low</b> 83:17 130:5 <b>lower</b> 77:7 117:15 121:13 134:20 <b>L-E-T-I</b> 117:1,1  <hr/> <b>M</b> <hr/> <b>M</b> 63:13 110:4 <b>made</b> 66:19 84:23 91:22 93:4 114:5 115:21,23 129:17 129:21 132:6 150:5 <b>main</b> 73:7,11 <b>Major</b> 122:15 <b>make</b> 70:8 109:10 114:16 141:9 143:11,13 149:15	151:20 <b>makes</b> 81:21 109:9 <b>making</b> 84:24,25 103:1 122:1 123:5 <b>managed</b> 95:11 <b>Manager</b> 68:22,24 71:14 77:24 78:6 95:20 <b>managerial</b> 78:19 <b>managing</b> 120:5 <b>Manella</b> 63:20 <b>Manges</b> 64:3 <b>manipulation</b> 96:19 <b>manufactured</b> 72:20 <b>many</b> 138:13 147:17 <b>map</b> 145:24 <b>marginal</b> 101:3,9 101:11,12,13 <b>mark</b> 76:5 81:25 88:10 111:13,15 <b>marked</b> 76:15,18 82:3,7 88:13,18 90:3 110:9 111:19 111:22 118:20,21 139:13,14 <b>marketing</b> 95:23 146:15 <b>material</b> 84:4 109:1 134:19 <b>materials</b> 64:1 66:5 66:11 83:24 89:12 130:10 147:12 148:13,17 <b>matrixes</b> 67:11 <b>Matt</b> 150:22 155:20 <b>matter</b> 105:16 159:3 160:7 161:12 <b>Matt's</b> 156:10 <b>maximum</b> 75:13 109:22 <b>may</b> 75:25 84:15 92:1,19 94:13,21 95:5,18,24 97:10 102:21 104:10,25 112:24 117:15,20 118:11 137:16 141:17 <b>mean</b> 69:4 83:9 85:18 116:17,18 117:18 118:11	122:8 123:25 142:11,12 155:24 156:1,7 <b>means</b> 69:7 109:13 109:14,15 125:2 129:7 132:19 152:6 <b>meant</b> 122:6 124:3 153:12 <b>measurable</b> 137:17 <b>mechanisms</b> 98:4 <b>meet</b> 83:21 149:22 <b>meeting</b> 82:12,12 82:13,16 83:2 96:4,5,6,10,23,24 97:1,13,15,15 98:14,20 102:4 112:24 113:1,9,19 113:21 115:20 120:25 150:8 <b>meetings</b> 65:23 97:2 97:7 112:7 119:24 147:1 <b>MELNIK</b> 63:19 67:25 74:24 75:23 90:5 91:9 92:15 93:25 94:3 103:21 110:12 127:9 128:2 133:6 134:23 135:2,24 137:7 147:9 150:13 151:12,15 153:14,17 154:21 156:13 <b>members</b> 146:19 <b>memo</b> 90:3,15,17 91:6,18 92:11,20 94:13 104:11 150:22 157:3,5 <b>mentioned</b> 94:21 118:24 122:24 158:8 <b>merely</b> 81:23 <b>met</b> 149:24 <b>Metallization</b> 94:13 94:14,16 95:2,6,9 95:11,17 <b>metals</b> 132:17 <b>method</b> 125:10 <b>methods</b> 83:11 122:9,10,12 <b>MICHAEL</b> 63:4 <b>micron</b> 155:6,16	<b>microns</b> 137:23 152:25 154:15,22 <b>middle</b> 82:19 <b>might</b> 71:10 79:15 80:24 81:7,7,8 86:12 130:9,10 131:7 132:8 <b>mind</b> 148:25 151:10 <b>mine</b> 151:25 <b>minute</b> 107:4 <b>minutes</b> 107:7 <b>modeling</b> 83:7,9,10 83:17 84:20 96:25 <b>modification</b> 139:25 140:2,5,6 <b>modifications</b> 117:23 140:8 <b>modified</b> 125:12 129:23 130:19 131:11 <b>moment</b> 67:4 89:23 154:1 <b>Monday</b> 82:12 <b>Montana</b> 63:16 <b>Montgomery</b> 149:1 <b>months</b> 80:12,13 <b>more</b> 80:19 92:9 118:20 125:11 139:8 141:7 149:8 <b>morphology</b> 96:21 98:15 <b>Most</b> 81:10 <b>mostly</b> 104:14,20 <b>motivation</b> 69:22 <b>Motorola</b> 72:4,10 <b>move</b> 138:20 144:3 148:10,12 <b>Mu</b> 85:12,14 86:11 86:14 89:3 90:23 96:13 145:19 <b>much</b> 104:17 127:7 127:7 148:19 156:19 <b>multi-page</b> 119:5 <b>Multnomah</b> 158:2 <b>mutual</b> 98:3 <b>myself</b> 89:3 90:23 147:3  <hr/> <b>N</b> <hr/> <b>name</b> 77:8,21 78:2 112:11,11 119:11 121:16 161:16	<b>named</b> 85:13 <b>names</b> 78:10 <b>natural</b> 76:11 <b>nature</b> 119:16 <b>NEC</b> 72:5,11 <b>necessarily</b> 94:25 103:15 106:12 <b>need</b> 67:21 80:25 97:18 149:4 <b>needed</b> 132:22 146:3 <b>needs</b> 81:19 <b>Nevarez</b> 62:16 158:3,23 <b>next</b> 68:9 76:4,6 81:25 88:9,11 109:24 110:7 111:15 112:11 143:9 <b>Nicholas</b> 64:2 149:24 <b>nominal</b> 107:18,25 140:9 <b>none</b> 156:17 <b>non-conductive</b> 130:5 132:17 <b>Notary</b> 160:19 <b>notations</b> 116:12,13 121:12,15 <b>note</b> 89:25 141:13 <b>notebook</b> 80:20 <b>noted</b> 78:6,17 85:11 147:13 <b>notes</b> 77:20 <b>nothing</b> 65:6 75:2 90:7,11,11 149:20 155:11 <b>notice</b> 147:14 <b>Novellus</b> 62:6 63:18 161:6 <b>NOVONLY0100...</b> 157:9 <b>nucleate</b> 130:8 <b>nucleating</b> 130:4 <b>nucleation</b> 130:15 <b>number</b> 74:4 78:19 80:23 88:4 94:7 94:22 111:23 123:23 134:12 138:16 142:5 144:8,16 145:16 146:2 151:5 155:7 155:7
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98:18 103:6 105:12 106:19 110:21 125:17 127:21,25 128:6 128:11 129:5 134:11 138:11,18 138:25 141:2 144:13 145:5,14 recommend 143:4 recommendation 69:7,10 70:9,21 143:23 recommendations 69:16 recommended 142:23,25 143:20 recommending 69:19 record 87:18 90:1 118:17 135:3 149:6 150:17 158:16 161:15 records 105:19 redesign 140:6 reduced 158:14 159:8 Redwood 64:4,5 refer 70:10 92:20 98:7 103:15 109:21,25 111:2 122:17 124:16,20 124:22 126:16 130:21 131:12 145:2 151:8 152:18 154:6 reference 80:4 82:20 93:5 97:14 104:6,14 106:1 109:9,10 114:25 115:1,3 120:7 122:16 124:25 129:24 149:16 150:6 152:8 references 114:18 referred 76:14 82:2 88:12 92:2,10 93:14 94:18 96:6 96:7,10 100:21 109:19 111:18 114:14 126:15 128:24 138:3 147:21 referring 80:5	91:24 97:12 106:10 122:13 154:4 refers 69:16 93:9 94:13 98:2 100:6 100:9 102:23 106:5 107:9,11 108:3 122:18 129:6 130:6,19 144:25 refresh 80:18 81:15 84:6 105:11 110:21 refreshed 81:7 regarding 84:15 113:2,25 120:24 135:8 regions 130:15 134:15,19,21 136:22 relate 71:17 90:19 112:16,19 related 71:19 77:16 77:19 102:12,16 111:10 relating 77:14 86:1 relation 142:13 relatively 111:11 130:4 132:23 reliably 128:13 relies 129:11 remember 67:9,10 69:21 80:9 84:9 85:3 97:5 103:24 105:7,20 107:17 117:11 122:1 126:5 128:12 143:8 144:20 148:1 replacement 95:9 report 78:13 reported 143:22 144:22,25 154:17 reporter 62:16 65:5 66:24 67:20 75:8 76:7,17 82:6 88:17 94:1 111:21 116:25 118:19 135:1 136:13,16 154:19 158:4,24 159:7 161:10 reports 120:14 represent 121:20	122:23 135:12 141:5,7 represented 96:15 138:19 represents 139:25 request 147:2 161:13 requested 86:16 159:6 require 132:9 140:7 required 74:18 88:4 120:13 145:16 146:1 Requirements 124:18 125:1 Reserve 63:15 resolve 71:11 133:11 resources 71:11 120:13 132:4 respect 142:17 response 94:6 responses 70:4 responsibilities 77:13,18 78:3,6 responsibility 79:12 79:16 rest 124:10 result 70:3 101:23 resulted 92:9 resulting 137:14 results 70:20,24 72:23 74:6 88:7 92:3,23 94:9 98:15 101:18 103:10 104:15,21 114:7 117:13 135:13,16 137:25 138:9 return 148:20 reverse 80:22 109:14 review 80:21 150:2 reviewed 89:12 117:12 reviewing 152:17 re-enrolled 148:23 RIEDINGER 63:3 68:5 73:13 75:15 75:19,24 76:5,16 81:22 82:5 87:16 87:19,20 88:10,15 88:16 90:13 91:1	91:14,23 93:7 94:11 97:21 104:8 105:10 110:15,23 111:13,20 117:2 118:14,18 127:15 128:16 133:7 134:4 135:4,6,18 136:23 137:19 138:2 139:6 142:15 147:19 149:3,7 150:11,16 151:10,14 156:15 156:18 right 66:21 77:7 110:6 117:15 121:13 126:9 149:5 151:6 152:3 155:4 156:3 right-hand 109:14 110:14 153:10 154:9 rise 136:9 Ritzdorf 73:16 77:22 78:9,17 91:6 104:13,24 133:23 road 145:24 Roadmap 146:7 role 70:25 71:5,6 72:8,13,14 73:19 86:6,10 87:13,21 95:16 ROMAN 63:19 Roman's 147:14 rotation 70:6 74:7 roughly 97:24,25 108:23 Rules 158:6 run 70:18,19 104:6 runs 74:5  S same 80:23 90:2,2 93:12 97:9 108:3 114:14,21,22 120:2 122:16 126:21 129:1 138:6 141:11 159:7 161:13 San 82:20,24 83:1 Santa 97:3,7,12 sat 134:2 saw 155:7	saying 81:23 says 75:10 96:3 101:3 109:24 110:3 124:18 129:3 141:15,24 153:11 154:23 scaler 153:2 scenario 134:18 school 148:18,20 scope 78:2 95:1 112:21 se 75:4 131:24 Seattle 63:9 second 62:13 68:7 102:14,15 105:24 106:1 111:4 114:13,15,19 115:6,7,11 116:1 130:18 136:25 141:24,25 142:4,9 142:20,22 secondarily 75:13 section 124:17 sections 118:9 see 77:8,10 81:12,19 97:24 112:14 118:23 139:8 154:8,25 155:5 seed 71:17,18,21 74:16,17,18,21,21 75:4,16 76:2 77:9 77:14,16,19 79:12 79:16,19,22 80:8 80:10 86:1,5,14 86:17,19,21 87:4 100:10 101:3,10 101:11,15,19,25 102:17 103:11,18 104:18 107:9,10 108:1 111:11 112:22 116:20,22 117:4,24 120:20 120:24 121:7 122:3,5 123:8,23 124:4,8,9,12,14 124:18,24 125:1,2 125:5,10,14,22,25 126:10,19 127:19 127:22 129:1,4,9 129:13 130:11,16 130:17 131:10,22 132:1,8 133:3,13 133:15 134:9,15
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149:23 150:1,21 151:17 153:9 154:1 point 73:1,11 75:1 127:12 129:2,3 130:18 131:16 145:20 148:21 pointing 147:9 points 73:5,7,17 94:9 133:19 poor 155:10 portion 77:17 110:25 Portland 62:14 148:8 149:2 158:20 position 66:7,8 68:18 120:2,4 possible 71:20 74:4 83:8 84:21 96:20 114:23 117:21,22 126:19,23,24 127:2,4 possibly 104:20 post 118:8 potential 83:6 PR 109:12,13 practice 116:4 preceded 76:2 precipitate 108:1 predecessors 92:24 preexisting 124:4,7 124:14 125:2 131:22 preferentially 136:7 premarked 66:25 prepare 114:25 121:9 149:18,20 prepared 68:15,23 112:7 117:19 118:12 119:23 127:19 132:18 144:19 146:8 prerequisite 132:10 presence 124:23 present 64:8 83:24 112:25 129:15,19 presentation 84:23 85:4 115:22,24 120:24 121:6 122:1,22 123:6,9 129:16,18,20 presentations 84:24	85:1 120:8 presented 84:8,15 115:19 121:21,23 146:25 presenters 112:9 pressure 83:17 presumed 101:9,12 101:13,25 pretty 155:10 previous 85:12 87:12,24 92:22 101:14 103:15 124:24 126:16 150:7 156:8 previously 87:6 90:3 110:9 120:3 139:13,14 pre-clean 154:3 pre-wet 154:2,3 principal 73:1,17 133:24 145:20 principally 65:16 prior 72:20 81:4 86:18,23 87:4 89:11 102:19 104:25 123:13,19 124:5 131:10 133:16,17 138:20 155:2 priorities 71:12 probably 92:6 109:21 127:16 148:3 problems 72:16 Procedure 158:6 proceedings 158:18 process 68:22,24 69:3,9 70:2,3 71:15 74:19 75:6 78:5 86:23 87:1,5 91:5 92:20 94:14 94:15,16 95:2,6,9 95:12,17,20 102:19 103:12,20 104:18,21 106:14 107:5 109:16 114:24 120:5 124:3,5,14 125:23 126:1,11,20 128:10 129:11 131:13,16,18 132:24 133:12 134:8 136:20	138:22 149:15 155:1,15 processed 106:11 processes 70:16 71:3 75:12 107:1 124:23 125:12 126:17 128:14 132:16 133:14 processing 72:21 118:8 processor 114:24 produce 71:20 86:5 86:8 103:10 106:17 128:13 134:17 produced 134:17 135:16 140:24 145:25 151:3 producing 67:10 129:13 136:21 Product 66:8 production 67:1 76:19 82:8 88:19 111:23 119:2,4,6 123:22 142:5 143:10 157:9,10 programs 66:11 79:24 80:10,15 project 120:12 projection 146:2 promised 132:3 property 131:4 proposal 90:24 91:21 102:16,24 103:1,5,16 proposals 89:2 139:9 proposed 138:17 140:1 145:17 propounded 158:11 provide 86:16 88:5 provided 89:14 96:13 135:4 144:10 145:12,14 146:11,13,14,16 Public 160:19 pull 150:21,21 pulling 120:13 pulse 109:14 pulsed 109:17,17 pulsing 109:20 purpose 86:25 100:2,5	purposes 128:7 pursuant 158:5 pursue 102:21 pursued 88:1 116:21 142:25 put 105:3 132:11 putting 118:22 135:8 PVD 101:3,9,25 102:17 103:18 116:20 117:23 122:13 125:10 130:16 152:10 155:1 <hr/> Q quality 151:3,5,9 155:10,15 question 67:22,24 69:6 81:16 92:5 97:19 105:13 124:22 125:21 127:17 133:8 134:24 135:1,12 139:2 questions 133:25 135:10 148:4 149:8 150:12,15 156:14,16 quick 138:19,23 151:11 quotations 110:2 quote 102:23 <hr/> R range 90:2 105:3 107:6,7,22 125:4 127:6,20 128:6,7 128:9 152:25 ranges 131:5 rate 75:14 rates 107:2,3 rather 81:2 117:23 131:8 140:7,14 ratio 100:14 RE 161:3 reactor 83:8,13 84:21 96:25 reactors 83:18 read 76:12 81:4,13 87:16,18 89:22 102:15 134:24 135:3 159:10	161:11,13 reading 76:11 reads 102:15 137:2 really 155:10 reason 84:1 93:8 99:7 161:22,25 162:3,6,9,14,17 162:20,23 163:1,4 reasons 87:9 108:21 161:15 recall 68:21 70:19 72:2 75:1 76:1 77:3 79:2,6,15,17 80:7,14 83:22,23 84:19,22,24 85:4 85:5 88:6 89:10 92:2 94:24 95:8 95:24 96:23 97:4 97:11 98:13 99:24 102:2,6,8 103:1,4 103:7,8,12 104:1 104:7,9,12 105:1 105:8,15 110:22 111:4 113:2,4,4,5 113:8,18 114:11 115:21,23,25 117:7,8,12 123:3 123:7,10,14,18 126:2,10,14 129:17,18 133:1 133:10 134:1 138:14 141:20,21 144:6 145:9 146:9 147:16 recalled 110:20 receive 108:9,13 received 113:25 119:17 141:18 recognize 67:3,6 76:20 77:1 82:9 88:21 109:2,6 110:10,19 111:6 111:24 112:2 116:13 119:9,17 119:19 121:3,15 139:17 140:17 147:8 recollection 69:23 69:23 72:7 78:25 80:18 81:7,16 82:13,15,25 83:4 83:5 84:6,10,18 93:22 96:9,12
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supplementation 125:13 supplemented 124:5 125:6,8 126:4 supplementing 103:18 124:14 sure 67:5 69:5 79:8 111:2 114:16 150:16 151:12,20 surface 132:14,14 surfaces 130:5 132:18 SW 62:13 sworn 65:4 158:9 160:6,15 symmetrical 108:22 Systems 62:6 161:6 S-E-M 154:20	110:7 111:19,21 118:19 134:25 149:9 150:20 151:16 158:6 159:2 160:5,13 161:7 162:10 163:8 team 94:17 120:8,9 120:10,17,20 technical 79:23 85:3 95:22 132:21 133:25 137:9 technological 145:25 technologies 66:10 technology 66:9 76:25 77:13 78:8 78:21 79:13 80:7 94:19 95:7 112:6 113:1,11 115:19 119:25 120:15,16 121:24 126:13 146:17,19 tell 65:5 73:23 80:5 89:23 141:12 149:11 ten 107:7 tendency 76:11 136:5 tends 131:3 term 100:8 124:1 152:5 terms 94:17 100:23 testified 65:7 testimony 118:25 158:12,17 text 96:2 110:13,17 141:16 thank 65:10,10 82:4 87:19 88:15 90:14 107:8 124:10 128:4 134:5 135:5 137:24 151:14 153:15 156:13,18 Thanks 96:3 their 72:15,17 83:19 86:17,21 103:11 107:1,18 107:25 140:8 147:2 thereof 158:19 thick 81:2 125:3,14 125:14	thicker 127:5,8 thickness 75:6,12 100:10,14,16 106:8,11,15,18 107:18 108:4,4,5 108:6,13,16 125:25 126:6 127:12 128:17,18 140:9 154:5 thicknesses 107:10 107:11,15 108:19 122:20 126:18,22 126:24,25 127:1,3 127:21 140:10,12 thin 101:15,17 125:10 132:22 thing 67:19 81:6 100:17 things 70:16 76:12 think 80:22 81:5,6 81:14 94:21 121:13 126:8 132:6 153:12 155:19 thinner 107:25 127:5,7 third 63:7 97:23 108:12,14 111:4 115:14,15 116:2 116:11,14 117:14 117:17,19 122:2,4 124:17 153:9 154:7 Thomas 62:10 65:1 65:3 158:6 159:2 160:5,13 161:7 162:10 163:8 though 75:1 109:20 137:16 thought 99:18,20 133:18 three 98:22 99:2 107:9,11 118:20 121:14 122:4 142:24 143:5 three-page 76:18 through 67:1 76:19 80:3 81:11,17 88:19 96:17,19 104:3 110:3 119:4 119:7 120:14 143:10 144:9 145:20 146:5	thrust 79:23 thrusts 120:16 time 69:20,22 70:18 73:12 78:21,23 79:14,21,24 80:11 80:12,16,21 82:24 83:1 84:16,25 85:1 89:9 91:21 92:9 94:23 95:13 95:21,25 103:25 105:7 106:16,17 106:20,23,23 114:5 123:19 125:18 126:3 127:18 128:15 133:16,18 139:4 145:21 150:3,4 158:7 159:4 160:8 times 82:23 105:17 140:25 timing 73:22 title 68:20 124:1 159:4 160:9 titled 112:5 today 65:13 81:11 89:20 118:25 130:23 149:10 today's 149:19,21 together 111:15 158:12 told 149:3 Tom 73:16 77:22 78:9,17 82:21,22 91:6 104:13 133:23 top 94:12 100:11,16 116:15 122:21 136:6,8 152:11,24 topic 97:2,7 103:16 123:10,13 topics 121:7 total 144:8,15 145:15 totally 151:12 transcript 150:6 158:15 159:11 160:6,10 161:11 161:18 transmitted 141:17 treated 78:22 trench 137:15 trenches 100:25 137:22	true 115:9 121:22 121:25 142:19 158:16 160:10 truth 65:5,5,6 try 67:21 76:7 105:3 125:20 trying 91:2 127:16 133:11 141:8 turn 122:2 123:21 Turner 73:19 77:25 78:18 82:23 104:14,24 two 66:22 67:12 69:16 73:25 74:15 74:15 97:6 114:18 115:4 117:25 122:4 149:25 152:1 two-inch 81:17 two-plus 70:22 type 143:15,16 155:6 types 109:25 142:24 typewriting 158:14 typewritten 159:8 typically 100:13 119:23
<b>T</b> T 63:5 table 68:4 85:7 134:2 tables 67:14 74:1 tabular 99:1 take 95:22 99:4,9 104:24 107:6 118:14 121:2 140:11 148:3 149:4 150:13 151:11,17 153:9 taken 105:18 133:15 158:13 159:3,7 160:7 161:12 taking 67:20 78:20 94:23 112:22 158:18 talk 80:1 talked 149:10 talking 133:8 151:21 tape 149:4 target 126:7,17,22 126:25 127:3,21 128:7,17,18 targets 106:8 140:9 tax 105:19 Taylor 62:10 65:1,3 65:10 67:3 68:6 76:15,17 82:3,6 82:21,22 88:13,17	<b>T</b> T 63:5 table 68:4 85:7 134:2 tables 67:14 74:1 tabular 99:1 take 95:22 99:4,9 104:24 107:6 118:14 121:2 140:11 148:3 149:4 150:13 151:11,17 153:9 taken 105:18 133:15 158:13 159:3,7 160:7 161:12 taking 67:20 78:20 94:23 112:22 158:18 talk 80:1 talked 149:10 talking 133:8 151:21 tape 149:4 target 126:7,17,22 126:25 127:3,21 128:7,17,18 targets 106:8 140:9 tax 105:19 Taylor 62:10 65:1,3 65:10 67:3 68:6 76:15,17 82:3,6 82:21,22 88:13,17			<b>U</b> ultimate 125:25 ultimately 86:22 134:6 unable 134:14 under 78:4,6 79:5 84:2 101:2 107:10 112:10 120:8 122:15 129:23 130:19 137:1 underneath 77:21 141:15 understand 99:7,7 114:17 119:13 151:20 understanding 69:25 100:7 139:9 152:5 153:24 understood 70:4 79:8 underway 79:24 80:10,15 Unfortunately 126:2 uniformed 129:14

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136:21 137:3 138:21 140:10,12 147:11 149:12,17 152:11 155:1 Seed/barrier 112:12 seeing 77:3 81:8 89:10 seem 97:4 103:7 156:11 seems 75:2 99:8 147:11 155:18 seen 79:2 segregation 146:23 SEM 152:14,18,19 153:5,9,24 154:8 154:10,18 155:7 155:10,13,14 Semitool 62:2 63:2 63:14 65:16,22 67:1 68:18 70:19 71:3,24 72:21,22 77:1,5,19 78:20 85:6 104:5 105:14 107:20 123:1,17 129:21 134:7 149:13,17 161:5 SEMs 151:5,9,18,23 152:15 sense 81:21 94:8 sensitive 129:3,9 sent 66:23 sentence 102:14,23 103:14 105:25 137:2 separate 91:13 108:15 142:10,11 142:12,16 143:11 143:13 separately 68:3 separation 70:6,7 74:7,9 sequence 96:16 series 69:17 70:13 70:17,21 92:7 93:12,20 96:13 session 65:11 set 91:10 94:9 108:10 154:17 159:4 160:8 several 65:18,25 78:10 104:13 105:17	shared 133:24 Sheet 161:1,16 Shores 64:4,5 short 102:18 103:2 103:19 106:5,6,6 106:15,16,17 Shorthand 62:16 65:4 158:4,24 show 81:18,20 96:19 137:11 155:14 showed 134:6,7 156:5 showing 78:9 shown 73:24 90:9 99:16 113:20 126:11 135:22 140:2 147:22 152:23 153:2,5 shows 155:1 Shu 85:13 shut 137:15 sic 93:1 101:3 114:1 115:1,2,4 side 68:1 101:24 109:14 110:14 136:2,12,19 154:9 154:13 sign 116:1,5 159:11 signature 68:6,10 89:4 115:10,13 139:21 163:7 signed 161:16 significant 66:17 99:18 117:8 significantly 107:1 similar 92:21 119:15 similarity 143:19 simply 99:15 116:9 since 89:17 108:17 154:4 single 111:22 119:1 141:5,7 sit 89:20 99:15 six 80:12,13 155:8 155:12 sixth 151:18,23 152:18 size 137:20 152:22 skip 97:22 sleet 79:2 slide 124:2	slightly 133:7 slit-like 136:1 slow 75:8 76:8 136:13 small 106:18 137:11 156:8,12 smaller 137:18 156:5 some 65:14,23 71:19 76:24 78:22 79:5,12 80:18 81:18 84:7 87:5 87:11,23 90:8 92:18 102:22 105:3 108:21 109:1,8 110:13 116:12 118:23 129:12 133:21 137:4,16,16 155:21 156:5 something 83:20 105:16,21 sometime 105:23 145:4 somewhat 90:8 130:22 sorry 74:11,25 80:9 97:20 99:6 105:6 114:16 115:3 128:2 134:23 139:3 144:11 151:24 153:14 sort 112:7 126:15 154:8 source 147:10 Southwest 149:1 specific 66:15 80:10 80:14 84:19 98:19 103:13 105:7 113:5,9 115:22 120:16 122:1 130:6 133:19 142:2 143:15 148:22 specifically 66:9 67:9 79:17,24 82:16 86:10 92:10 93:15 107:25 114:10 119:18 126:17 130:8 147:17 specified 138:6 speculation 127:10	128:4 speculative 130:22 speculatively 125:11 speed 74:7 split 108:4,5,5,7,12 108:15 splits 108:4 ss 158:2 standing 123:4 142:13,17 stands 99:9 Stars 63:21 start 66:2 105:14 119:8 starting 65:17 110:1 139:16 State 158:1,4 160:2 stated 87:9 89:19 statement 73:5 112:12 141:15 states 62:1 160:6 stenotype 158:13 step 87:14 100:6,7,9 100:13,17,21,22 100:24 101:4 134:19,21 155:2 steps 99:4,9 step-coverage 102:17 103:18 122:17,25 123:8 123:11,15 131:18 131:24 Stevens 90:5 151:4 STI 110:2 still 95:19 148:18 story 149:11 strategies 142:23 143:5 Street 149:1 strictly 109:19 strike 129:24 130:1 130:3,12 structure 79:1 99:11 100:12,15 100:16,21 101:24 128:9 136:7,8 137:14 structures 100:24 106:12 122:21 130:8,9 136:3 137:11,13,17,20 155:22 156:5,6,9	156:9 ST003068 153:19 ST021359 67:1 subject 69:2 82:11 104:10 109:6 122:25 123:15 133:2 submitting 107:19 SUBSCRIBED 160:15 subsequent 88:3 97:8 106:13 122:11 128:21 136:9 155:16 subsequently 70:25 71:8 subset 95:10 108:6 subsidiary 148:17 substantial 90:12 substantive 90:7 substrates 72:19,20 73:22 116:21,23 sub-bullet 124:17 129:3 sub-layer 124:7 success 72:15 86:13 86:15 123:11 135:21,22,23 137:4 155:21 successful 156:11 suggest 97:15 137:12 suggested 71:6 91:12 suggesting 81:15 84:3 suggestion 81:23 suggests 97:17 Suite 62:14 63:22 summarized 113:7 summary 137:1 144:7 super 131:4 superset 95:10 supervised 79:7 supervision 79:5 supplement 87:3 101:9 102:17 116:20 117:4 133:14 supplementary 101:5,7 129:8 131:9
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2002 62:12 65:2 158:21 160:16 161:8 201 64:4 206 63:10 149:2 20770 142:7 20771 143:10 20776 144:3,19,21 145:2,7,11 227-1010 63:24 23 62:12 65:2 141:17 161:8 24 70:12 91:5 24th 68:15 91:17 92:4 28th 82:12 158:21  3 3 98:8 99:5,16 108:25 118:5 143:16 155:13 3097 151:21 310 63:24 335 153:25 154:6 341 152:8,12,18 341-8 152:20 362 67:2  4 4 98:8,8,8 99:5,16 100:1 108:18 118:4 120:25 122:22 123:8,13 131:19 143:16 4th 121:18,21 133:3 4-2-97 157:8 4-29-97 157:5 45 108:17 140:8  5 5 89:1 93:10,11,13 93:18,19,23 98:9 109:24,25 143:16 144:1 155:14 5-1-97 157:6 5-2-97 157:7 50 67:3 68:14,23 69:2,10,15 70:9 73:25 74:15 85:21 85:23 90:20 91:17 92:8,14,24 93:6,9 157:3 500 106:9 107:12	124:19 125:3 126:18 127:5 128:6,14 140:14 140:15 51 76:18,21 78:11 79:11 80:4 157:4 52 82:7,9,11,20 84:2 96:7 157:5 53 88:14,18,21,23 88:25 89:1,5,7,10 89:17,20 90:15,19 91:4,16,25 92:12 92:20 93:1,4,10 93:19,24 94:12 96:3,11 98:6,23 99:5,17 100:1,8 102:10 106:1,24 107:9 108:25 114:15 115:1,7 118:3,4,11 138:4 144:1 147:20,25 157:6 54 111:17,22,25 112:3 113:15,20 114:2 157:7 55 119:1,8,9 157:8 56 118:22 121:3,3,5 121:6,9,12,20 125:24 126:12,21 157:9 57 118:22 139:7 147:5,8,23 157:10 583-8888 63:10 59901 63:16  6 6 89:2 93:11,11,14 93:18,19,23 98:10 99:25 100:3,5,6 101:3 102:3,4 106:2 107:11 113:2,22 114:1,13 114:14,17,19 115:1,2,4 137:25 138:3,7,10,12,24 139:10 140:1 144:9 145:3 6.8 109:20,22 6011 62:13 650 64:6 655 63:15  7	775 143:10  8 802-3034 64:6 84 88:19  9 9 77:8 109:22 9.0 109:20 9:15 62:12 900 63:22 90067 63:23 94-0303 158:25 94065 64:5 96 105:8 97 77:18 94:13 95:5 105:9 146:4 97201 149:2 98101 63:9 9901 119:7		
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<b>uniformity</b> 74:10 75:6,12 100:10 <b>UNITED</b> 62:1 <b>unsatisfied</b> 69:24 <b>unsuccessful</b> 134:13 134:21 136:20 137:10 155:24,25 156:4 <b>updated</b> 117:24 <b>upper</b> 134:19 152:1 153:10 154:12,12 154:13 <b>up-to-date</b> 66:4 <b>use</b> 100:8 <b>used</b> 85:20 114:24 123:25 132:16 137:2 <b>useful</b> 66:1 <b>using</b> 107:18 115:24 130:12 133:14 <hr/> <b>V</b> <b>vacuum</b> 122:9,12 122:19 <b>vague</b> 73:12 74:23 75:18,22 90:21 91:7,19 92:17 93:25 94:3 103:7 103:21 135:14,23 137:6 139:1 <b>vaguely</b> 103:8 <b>vagueness</b> 97:6 <b>value</b> 107:19 <b>variation</b> 138:10 145:3,6 <b>varied</b> 107:1 <b>variety</b> 71:21 <b>various</b> 70:5 <b>varying</b> 122:20 <b>very</b> 69:14 75:4 92:6 95:21 96:14 97:20 99:6 103:8 127:18 156:18 <b>viability</b> 88:2 <b>vias</b> 100:25 <b>Videographer</b> 64:9 <b>VIDEOTAPED</b> 62:9 <b>virtually</b> 133:25 <b>visualize</b> 96:21 <b>void</b> 153:6,7 155:12 <b>voiding</b> 87:6,11,23 <b>voids</b> 101:23 104:16	136:2,2,5,11,17 155:6 <b>Volume</b> 62:11 65:1 vs 62:4 161:5 <hr/> <b>W</b> <b>wafer</b> 74:7,8 109:17 152:8,10,18 153:25 154:6 <b>wafers</b> 74:18 86:9 88:4 96:14 99:12 107:19 108:9,12 108:14,17 117:5,9 137:4 138:13,16 138:19 140:8 144:8,10,16,24 145:1,10,16 <b>wall</b> 101:24 136:12 136:19 <b>walls</b> 136:2 <b>want</b> 81:12,18 114:16 148:4 151:20 <b>wanted</b> 143:4 <b>wants</b> 81:24 <b>Washington</b> 63:9 <b>way</b> 74:22 80:20 91:11 112:16 144:15 145:15 154:16 <b>ways</b> 108:7 135:20 <b>Weil</b> 64:3 <b>welcome</b> 81:13 <b>well</b> 80:17 81:9 85:20 96:14 105:23 127:18 130:25 136:2 152:19 <b>were</b> 65:15,15,21,22 66:19 69:19 70:13 70:17,21 72:1,15 72:16,20,25 73:7 74:11,18 77:5 78:19,19 79:10,17 79:23 80:6,7,15 83:18 84:7 85:9,9 85:12 86:7,19 87:8 91:4,12 92:3 92:10,24 93:4,14 93:19 94:6,22 95:1,3 96:15 97:6 97:10 98:16,16 99:1 101:18,20,25	104:16,16 105:12 106:8 107:14,19 108:17 112:21 113:14,18,19 117:3 119:23 120:4,12,17,20 125:18 126:3 128:15 130:15 133:17 134:5,12 134:12,13 135:7 135:11 136:1,12 136:18 137:10,13 137:14 140:13,14 144:6,9,12,22 145:10 146:1 147:18 <b>West</b> 63:15 <b>wet</b> 124:5 133:14 <b>we're</b> 65:19 81:10 <b>we've</b> 126:15 <b>while</b> 90:1 <b>whimsical</b> 90:9 <b>white</b> 154:9,11 <b>whole</b> 65:5 158:19 <b>witness</b> 74:25 75:10 76:9 82:4 90:7,22 91:10,20 92:18 94:5 97:20 103:24 105:6 110:19 117:1 118:16 127:11 128:5 133:10 135:15,25 136:15,18 137:8 139:3 147:15 151:8 153:16 154:20 158:9,12 158:17,20 <b>wonder</b> 93:11 <b>word</b> 77:9 84:3 114:24 <b>words</b> 115:7 <b>work</b> 68:24 71:23 75:16 76:2 78:16 80:8 84:11,16 98:4 104:3 107:20 112:22 116:19 148:14,15 <b>working</b> 72:14 84:5 85:7 87:25 94:17 95:3,19 105:14 <b>write</b> 88:23 89:7 99:15 110:24 111:1 139:19	140:20 141:1 <b>writing</b> 99:23 <b>written</b> 67:9 111:5 143:1 <b>wrote</b> 67:7 99:20 104:11 106:24 130:2 143:3 <hr/> <b>Y</b> <b>Yeah</b> 142:7 151:24 153:7 154:11 <b>year</b> 66:14 <b>years</b> 70:22 126:4 <b>yesterday</b> 66:24 149:23 <hr/> <b>0</b> <b>0.7</b> 137:23 152:25 154:14,22 155:6 155:16 <b>0.73</b> 154:18,23 <b>0.8</b> 152:25 154:14 <b>0014</b> 119:4 <b>001823</b> 119:2 <b>001833</b> 82:8 <b>003081</b> 88:19 <b>009884-901</b> 157:10 <b>009915</b> 76:19 <b>010012</b> 123:23 <b>01008</b> 119:4 <b>016466</b> 111:23 <b>0308</b> 149:1 <b>09884</b> 119:6 <hr/> <b>1</b> <b>1 92:1,19 93:9 94:13</b> 95:24 97:10 104:10 117:15,20 118:11 143:16 <b>1st</b> 66:16 104:25 <b>1.5</b> 154:2 <b>10-24-96</b> 157:3 <b>1000</b> 107:12,22 135:8,11,12,22 136:25 137:24 138:8 140:15 144:23,24 150:22 153:18 <b>1000-angstrom</b> 108:15 <b>1052</b> 90:4 <b>1053</b> 110:9,11,24 112:21 113:3	114:12 115:2,3,6 115:11,15,18 116:2,11 117:14 118:5 <b>1054</b> 139:13,16,19 139:24,25 140:3 141:12 <b>1056</b> 139:15 140:17 140:18,20,22,23 141:9,11,14 142:6 142:9,18,21 143:18 144:5 145:22 146:8 <b>11</b> 144:9 <b>11:44</b> 156:21 <b>1201</b> 63:7 <b>15</b> 108:18 140:7 145:1,10 <b>1500</b> 106:9 107:12 107:22 126:18 128:6 140:14 <b>1500-angstrom</b> 127:6 <b>16-01-06060</b> 62:4 <b>1600</b> 62:14 <b>16468</b> 110:13 <b>17</b> 76:19 <b>1800</b> 63:21 <b>1899</b> 161:4 <b>1996</b> 65:17 68:16,19 91:6,13 92:4 146:4 <b>1997</b> 65:16 77:8,12 77:18 78:13 79:4 80:2,3,13 82:14 82:17 84:12,17 85:2 92:1,19 104:10,25 105:4 117:16,20 118:11 120:18,25 121:18 121:21 122:23 123:9 126:7 131:19 133:4 <hr/> <b>2</b> <b>2 93:10 98:23 99:5</b> 99:16 100:1 107:8 140:3 141:25 142:4 143:16,21 <b>2nd</b> 112:24 <b>200</b> 124:18 125:3 <b>200-500</b> 125:1 <b>2001</b> 146:5
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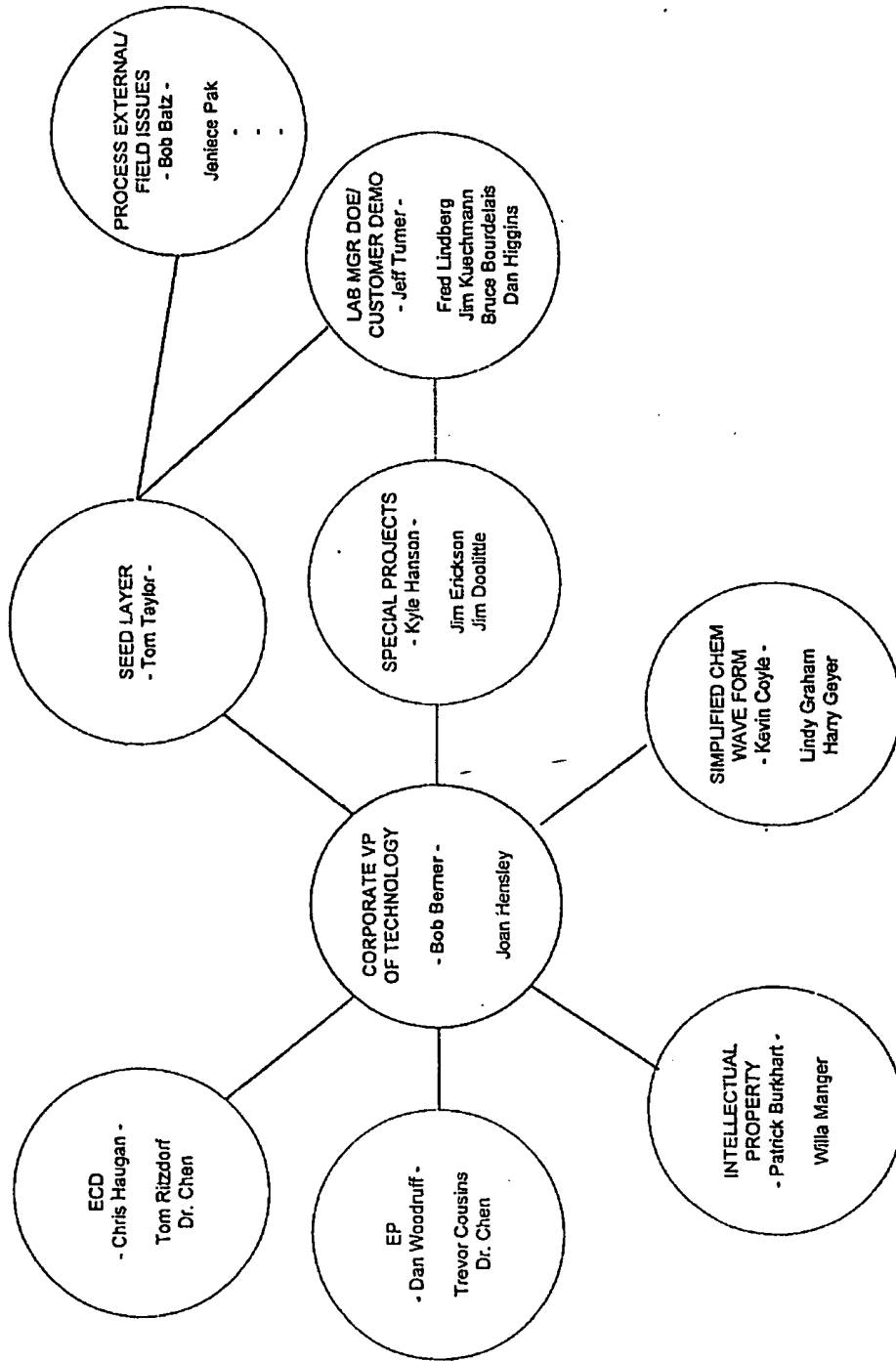
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# Exhibit F



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Advanced Technology Group



*Bob Berner*

April 9, 1997

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- Experiments



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- Reactor Design



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- 
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# Exhibit G

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To: Bob Berner, Chris Haugan, Dan Woodruff, Kevin Coyle, Tom Taylor,  
Kyle Hanson, Jeff Turner, Bob Batz, Patrick Burkhardt

From: Joan Hensley

Date: 2-Apr-97

Subject: Meeting Agenda, April 4, '97

cc: ATG Group, Ray Thompson, Greg Perkins, John Sullivan

---

### Agenda

Meeting: ATG Meeting  
Executive Lunch Room East & West  
Friday, April 4, 1997  
8:30 am

Presentations: Team leaders will each have approximately 20 min. for their presentation. The presentation will include their project description, tentative schedule, and the expected results to include the definition of the completion of the project/Criteria.

	<u>Presenter</u>	<u>Project</u>
8:30 - 8:50 am:	Chris Haugan	Modeling
8:50 - 9:10 am:	Dan Woodruff	Polish
9:10 - 9:30 am:	Kevin Coyle	Wave Form/Simplified Chem
9:30 - 9:50 am:	Tom Taylor	Seed Layer Development
9:50 - 10:10 am:	Kyle Hanson	Special Projects
10:10 - 10:20 am:	Bob Batz	Solder
10:20 - 10:40 am:	Patrick Burkhardt	Intellectual Property

CONFIDENTIAL

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Ex. 55

# Exhibit H

Tom Taylor

CONFIDENTIAL INFORMATION

NOVONLY010008

Ex. 56

# Barrier Layer Optimization

- Materials
  - Ti/TiN, Ta, TaN, WN, ...
- Deposition Method
  - PVD vs. CVD
- Selection Criteria
  - Cu Diffusivity at Elevated Temperatures
  - Adhesion to Dielectrics
  - Adhesion to ECD Seed Layer
  - Resistivity
  - Galvanic Reactivity With Cu
  - Morphology / Crystallinity



# Seed Layer Optimization

- Deposition Method
  - PVD vs. CVD
- Major Issues
  - Step Coverage
  - Thickness Requirements
    - Continuity in high aspect-ratio features
    - “Pinch-off” in throats of trench/via patterns
    - Scaling for current density effects vs. substrate diameter
    - Throughput balancing
  - Nucleation Site Density
    - Influence on ECD Cu morphology / grain size distribution

# PVD vs. CVD for Barrier/Seed

- PVD Methods
  - “Conventional”, collimated-beam, metal ion sputter
  - High temperature process for step coverage?
- CVD Methods
  - Thermal CVD vs. Plasma-Enhanced CVD (PECVD)
  - Precursor cost and efficiency
  - Better step coverage than PVD
  - Environmental concerns -- exhaust scrubbers
  - System cleaning requirements
- Combination Methods -- AMAT?

# Seed Layer Enhancement

- Electroless Cu on Thin PVD/CVD Cu Seed
  - No Applied Current Eliminates "Deplating" Danger
  - Less Sensitive to Initial Seed Layer Discontinuities
  - Initial Seed Layer Requirements 200 - 500 Å
  - Flexibility to Modify Pre-ECD Seed for Variations in Device Type, Substrate Size, ...
- Modified Electroplating
  - "Strike Bath" Concept
  - Electrolyte/Plating Conditions Optimized for Early Film Growth

Area 44-97

# Seed Layer Elimination

- Electroless Cu Dep on Catalyzed Barrier
  - Catalysts Include : Cu (naturally), Au, Pd, Pt, ?
  - Literature Includes Data on Catalytization of TiN by Immersion in PdCl or PtCl Baths
- Direct-to-Barrier ECD Plating
  - Identify Materials Which Are "Dual Function" -- Good Cu Diffusion Barrier and Platable with Good Uniformity and Adhesion
  - First Attempts w/ Ir and IrO<sub>2</sub>
  - Modified TiN ?

Tanner 4-1-97

# Project Schedule

Task	Q2/97			Q3/97			Q4/97		
	4/97	5/97	6/97	7/97	8/97	9/97	10/97	11/97	12/97
<i>Conventional Seed Layer Optimization</i> PVD vs. CVD Thickness, Morphology									
<i>Seed Layer Enhancement</i> Electroless Cu Strike Bath									
<i>Seed Layer Elimination</i> Electroless on Barrier ECD on Barrier									

1/11/97 4.4.97

# Exhibit I

# SEMITOOL<sup>®</sup>

Metallization Process Group

655 West Reserve Drive, PO Box 7010, Kalispell, MT 59904 Phone: 406-752-2107 Fax: 406-752-5522

## FAX COVER SHEET

To: Chun Mu Fax# 408-765-2949  
From: Thomas Taylor  
Date: May 1, 1997  
Subject: Experiment 5 & 6 Proposals Pages Including Cover: 4

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Dear Chun,

Thanks for hosting yet another fascinating meeting. You must know how much I love being shown experimental observations that I can't explain, since you manage to surprise me every time we get together.

I appreciate being given copies of the colorized SEM pastiches showing the evolution of the Cu deposition in a range of trench widths, and the unmanipulated photos from which the composites were produced. I have had a chance to review these with a number of the process engineers here in Kalispell, and we've tended to consensus on the probable mechanism for the different film growth behavior demonstrated by the various power supply settings (DC, FWD, PR). In general, we agree that the likely hypothesis is an interaction between the plating waveform (or peak current density) and the adsorption of the organic additives present in the electrolyte, particularly the leveller/suppressant agents.

As agreed, I have roughly defined experiments intended to increase our mutual knowledge of the mechanisms at work. As before, Semitool will supply the electroplating process, Intel will supply the wafers, and I will personally supply the dumbfounded looks when the results are presented.

The first experiment is directly related to the results discussed on Monday, April 28<sup>th</sup>, and should be self-explanatory. The second experiment is related to my proposal to supplement the step-coverage of PVD seed layers by a short electroless Cu deposition process prior to beginning electrolytic plating; if you are at all interested, we may choose to pursue this either immediately or at some later date.

Please call if you have any questions or suggestions on how the proposed experiments can be improved.

VERY BEST REGARDS,

T. TAYLOR

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Ex. 53

1 of 4

ST003081

#### Experiment 5 (in our ongoing series)

Evaluate interactions between the plating waveforms and peak current densities with the brightener and leveller/suppressant agents in the electrolyte.

Barrier : Ta or TaN, thickness = 150A

Seed layer : PVD Cu, thickness = 1500A

Experiment conducted as full factorial, with 5 electrolyte solutions and 9 plating power conditions. Five replicate wafers to be run (FWD pulse plating at standard current density, one at each bath composition). Total wafers required =  $[(9 \times 5) + 5] = 50$  wafers.

#### *Bath Chemistries To Be Evaluated :*

- 1) "STI Basic Bath" ( $\text{CuSO}_4/\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ )
- 2) Enthone-OMI CU BATH M with no additives
- 3) Enthone-OME CU BATH M with brightener/carrier agents only at nominal working strength
- 4) Enthone-OME CU BATH M with leveller/suppressant agents only at nominal working strength
- 5) Enthone-OME CU BATH M with both additive packages at nominal working strength as control

#### *Plating Power Supply Setpoints To Be Evaluated :*

For all conditions, peak cathodic current densities of 23mA/cm<sup>2</sup>, 30.5mA/cm<sup>2</sup>, and 38mA/cm<sup>2</sup>

For all conditions, total plated thickness of 4000 A (approx. 6.4 Amp min)

Conditions : DC plating, FWD pulse, Pulse Reverse

Please see the attached spreadsheet labelled EXPERIMENT 5 for the run-by-run schedule.

#### Experiment 6

Determine if marginal PVDseed layer step coverage can be improved by supplementary electroless deposition.

Barrier: Ta or TaN, 150A thickness

Seed layer : PVD Cu; thickness splits : 500A, 1000A, 1500A

Number of wafers per seed layer thickness : 15 (to allow for some trial-and-error process development in the following electroless deposition process)

Electroless deposition process targets : Add 500A, 1000A, 1500A of Cu (up to 5 wafers each per seed thickness)

Total number of wafers : 45

Following electroless deposition, one wafer per seed layer /electroless supplement thickness combination will be sectioned for SEM analysis. The remaining wafers will be processed through a baseline Cu electroplating recipe, consisting of Enthone-OMI CU BATH M with additives, and FWD pulse plating at nominal parameters. Wafers will be sectioned to determine gap fill characteristics and grain morphology. XRD should be performed to determine crystallinity and orientation.

Please see the attached spreadsheet labelled EXPERIMENT 6 for the run-by-run schedule.

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2 of 4

ST003082



# EXPERIMENT 5

- Bath Types :
- 1) "STI Basic Bath"
  - 2) CU BATH M with no additives
  - 3) CU BATH M with brightener/carrier only
  - 4) CU MATH M with leveller/suppressor only
  - 5) CU BATH M with all additives (brighteners and levellers)

Wafer #	Bath Type	Applied Power	Peak Current
1	1	DC	6.8A
2	1	DC	9.0A
3	1	DC	11.2A
4	1	FWD	6.8A
5	1	FWD	9.0A
6	1	FWD	11.2A
7	1	PR	6.8A
8	1	PR	9.0A
9	1	PR	11.2A
10	2	DC	6.8A
11	2	DC	9.0A
12	2	DC	11.2A
13	2	FWD	6.8A
14	2	FWD	9.0A
15	2	FWD	11.2A
16	2	PR	6.8A
17	2	PR	9.0A
18	2	PR	11.2A
19	3	DC	6.8A
20	3	DC	9.0A
21	3	DC	11.2A
22	3	FWD	6.8A
23	3	FWD	9.0A
24	3	FWD	11.2A
25	3	PR	6.8A
26	3	PR	9.0A
27	3	PR	11.2A
28	4	DC	6.8A
29	4	DC	9.0A
30	4	DC	11.2A
31	4	FWD	6.8A
32	4	FWD	9.0A
33	4	FWD	11.2A
34	4	PR	6.8A
35	4	PR	9.0A
36	4	PR	11.2A
37	4	DC	6.8A
38	4	DC	9.0A
39	4	DC	11.2A
40	5	FWD	6.8A
41	5	FWD	9.0A
42	5	FWD	11.2A
43	5	PR	6.8A
44	5	PR	9.0A
45	5	PR	11.2A
46	1	FWD	6.8A
47	2	FWD	6.8A
48	3	FWD	6.8A
49	4	FWD	6.8A
50	5	FWD	6.8A

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ST003083

3 of 4

DC AND PR FWD  
6.8 AND 9.0  
5 BATHS  
2 3 BATHS

2.0 6.8 9.0 11.2  
2.0 6.8 9.0 11.2  
2.0 6.8 9.0 11.2

## Experiment 6

<u>Wafer #</u>	<u>Seed Layer Thickness</u>	<u>Electroless Cu Thickness</u>	<u>Post-processing</u>
1	500 A	500 A	SEM Section
2	500 A	500 A	Electroplate (1.0m) and SEM Section
3	500 A	500 A	Electroplate (1.0m) and SEM Section
4	500 A	500 A	Electroplate (1.0m) and SEM Section
5	500 A	500 A	Electroplate (1.0m) and SEM Section
6	500 A	1000 A	SEM Section
7	500 A	1000 A	Electroplate (1.0m) and SEM Section
8	500 A	1000 A	Electroplate (1.0m) and SEM Section
9	500 A	1000 A	Electroplate (1.0m) and SEM Section
10	500 A	1000 A	Electroplate (1.0m) and SEM Section
11	500 A	1500 A	SEM Section
12	500 A	1500 A	Electroplate (1.0m) and SEM Section
13	500 A	1500 A	Electroplate (1.0m) and SEM Section
14	500 A	1500 A	Electroplate (1.0m) and SEM Section
15	500 A	1500 A	Electroplate (1.0m) and SEM Section
16	1000 A	500 A	SEM Section
17	1000 A	500 A	Electroplate (1.0m) and SEM Section
18	1000 A	500 A	Electroplate (1.0m) and SEM Section
19	1000 A	500 A	Electroplate (1.0m) and SEM Section
20	1000 A	500 A	Electroplate (1.0m) and SEM Section
21	1000 A	1000 A	SEM Section
22	1000 A	1000 A	Electroplate (1.0m) and SEM Section
23	1000 A	1000 A	Electroplate (1.0m) and SEM Section
24	1000 A	1000 A	Electroplate (1.0m) and SEM Section
25	1000 A	1000 A	Electroplate (1.0m) and SEM Section
26	1000 A	1500 A	SEM Section
27	1000 A	1500 A	Electroplate (1.0m) and SEM Section
28	1000 A	1500 A	Electroplate (1.0m) and SEM Section
29	1000 A	1500 A	Electroplate (1.0m) and SEM Section
30	1000 A	1500 A	Electroplate (1.0m) and SEM Section
31	1500 A	500 A	SEM Section
32	1500 A	500 A	Electroplate (1.0m) and SEM Section
33	1500 A	500 A	Electroplate (1.0m) and SEM Section
34	1500 A	500 A	Electroplate (1.0m) and SEM Section
35	1500 A	500 A	Electroplate (1.0m) and SEM Section
36	1500 A	1000 A	SEM Section
37	1500 A	1000 A	Electroplate (1.0m) and SEM Section
38	1500 A	1000 A	Electroplate (1.0m) and SEM Section
39	1500 A	1000 A	Electroplate (1.0m) and SEM Section
40	1500 A	1000 A	Electroplate (1.0m) and SEM Section
41	1500 A	1500 A	SEM Section
42	1500 A	1500 A	Electroplate (1.0m) and SEM Section
43	1500 A	1500 A	Electroplate (1.0m) and SEM Section
44	1500 A	1500 A	Electroplate (1.0m) and SEM Section
45	1500 A	1500 A	Electroplate (1.0m) and SEM Section

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May 1, 1997

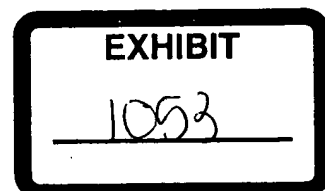
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4 of 4

ST003084

# Exhibit J

Tom Taylor



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**ST016467**

### Experiment 6

Determine if marginal PVD seed layer step coverage can be improved by supplementary electroless deposition.

Barrier: Ta or TaN, 150A thickness

Seed layer : PVD Cu; thickness splits : 500A, 1000A, 1500A

Number of wafers per seed layer thickness : 15 (to allow for some trial-and-error process development in the following electroless deposition process)

Electroless deposition process targets : Add 500A, 1000A, 1500A of Cu (up to 5 wafers each per seed thickness)

Total number of wafers : 45

Following electroless deposition, one wafer per seed layer /electroless supplement thickness combination will be sectioned for SEM analysis. The remaining wafers will be processed through a baseline Cu electroplating recipe, consisting of Enthone-OMI CU BATH M with additives, and FWD pulse plating at nominal parameters. Wafers will be sectioned to determine gap fill characteristics and morphology. XRD should be performed to determine crystallinity and orientation.

*T. A. WORK*

# Experiment to Evaluate Electroless Cu Supplement of CVD Seed Layer

Evaluate Gap Fill, Grain Morphology

PVD { INTEL }  
CVD { LETI }

Wafer #	Seed Layer Thickness	Electroless Cu Thickness	Post-processing
1	500 A	500 A	SEM Section / Semitool
2	500 A	500 A	Electroplate (1.5m) and SEM Section / Semitool
3	500 A	500 A	Electroplate (1.0m) and SEM Section / INTEL
4	500 A	500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
5	500 A	500 A	Electroplate (1.5m) and Damascene CMP / INTEL
6	500 A	1000 A	SEM Section / Semitool
7	500 A	1000 A	Electroplate (1.5m) and SEM Section / Semitool
8	500 A	1000 A	Electroplate (1.0m) and SEM Section / INTEL
9	500 A	1000 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
10	500 A	1000 A	Electroplate (1.5m) and Damascene CMP / INTEL
11	500 A	1500 A	SEM Section / Semitool
12	500 A	1500 A	Electroplate (1.5m) and SEM Section / Semitool
13	500 A	1500 A	Electroplate (1.0m) and SEM Section / INTEL
14	500 A	1500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
15	500 A	1500 A	Electroplate (1.5m) and Damascene CMP / INTEL
16	1000 A	500 A	SEM Section / Semitool
17	1000 A	500 A	Electroplate (1.5m) and SEM Section / Semitool
18	1000 A	500 A	Electroplate (1.0m) and SEM Section / INTEL
19	1000 A	500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
20	1000 A	500 A	Electroplate (1.5m) and Damascene CMP / INTEL
21	1000 A	1000 A	SEM Section / Semitool
22	1000 A	1000 A	Electroplate (1.5m) and SEM Section / Semitool
23	1000 A	1000 A	Electroplate (1.0m) and SEM Section / INTEL
24	1000 A	1000 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
25	1000 A	1000 A	Electroplate (1.5m) and Damascene CMP / INTEL
26	1000 A	1500 A	SEM Section / Semitool
27	1000 A	1500 A	Electroplate (1.5m) and SEM Section / Semitool
28	1000 A	1500 A	Electroplate (1.0m) and SEM Section / INTEL
29	1000 A	1500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
30	1000 A	1500 A	Electroplate (1.5m) and Damascene CMP / INTEL
31	1500 A	500 A	SEM Section / Semitool
32	1500 A	500 A	Electroplate (1.5m) and SEM Section / Semitool
33	1500 A	500 A	Electroplate (1.0m) and SEM Section / INTEL
34	1500 A	500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
35	1500 A	500 A	Electroplate (1.5m) and Damascene CMP / INTEL
36	1500 A	1000 A	SEM Section / Semitool
37	1500 A	1000 A	Electroplate (1.5m) and SEM Section / Semitool
38	1500 A	1000 A	Electroplate (1.0m) and SEM Section / INTEL
39	1500 A	1000 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
40	1500 A	1000 A	Electroplate (1.5m) and Damascene CMP / INTEL
41	1500 A	1500 A	SEM Section / Semitool
42	1500 A	1500 A	Electroplate (1.5m) and SEM Section / Semitool
43	1500 A	1500 A	Electroplate (1.0m) and SEM Section / INTEL
44	1500 A	1500 A	Electroplate (1.5m) and Evaluate Grain Morphology / INTEL
45	1500 A	1500 A	Electroplate (1.5m) and Damascene CMP / INTEL

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May 1, 1997

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ST016469

## *Barrier / Seed Layer Development*

### Experiments in Progress or Planning

#### Intel

Experiment to supplement PVD Cu seed with electroless Cu

Experiment to evaluate Ti, TiN, W, Ni, Al as platable seed/barrier layers

#### LETI

Experiment to supplement CVD Cu seed with electroless Cu

#### NCSU

Experiment to evaluate alternate PVD Cu seed deposition method

#### Independent

Experiment to determine if electroless Cu can be deposited reliably on activated TiN surface

Source of wafers : Sematech CMP Project

Experiment to evaluate Ir as platable barrier

# Exhibit K



# Advanced Technology Group

Meeting

9 am

Fri., May 2, 1997

Executive Lunch Rooms -East/West

## Agenda

### Project

### Presenter

9:00 - 9:10

Jeff Turner

Lab Scheduling and Resources

9:10 - 9:20

Tom Ritzdorf

Physical Parameter DOE  
-Experimental Design  
-Status and Plans

9:20 - 9:30

Kevin Coyle

Simplified Cu Electrolyte DOE  
-Experimental Design  
-Status and Plans

9:30 - 9:40

Tom Taylor

Seed/Barrier Layer Develop.  
-Experimental Design  
-Status and Plans  
Intel Mtg Update/Results

9:40 - 9:50

Lindy Graham

Investigation of Additive/Waveform Interactions in  
P.O.R. -INTEL Experimental Design

9:50 - 10:00

Bob Batz

Field ECD Process Support Plans

# Exhibit L

# SEMITOOL®

Metallization Process Group

655 West Reserve Drive, PO Box 7010, Kalispell, MT 59904 Phone: 406-752-2107 Fax: 406-752-5522

## FAX COVER SHEET

To: Dr. Shu Jin / Intel Fax# (408) 765-2949  
From: Tom Taylor Phone#: 406-752-2107  
Date: May 23, 1997 Fax#: 406-755-3226  
Subject: Experiment 6 / Rev 2 Pages Including Cover: 2

---

Hello, Shu.

Hopefully we'll get a chance to talk about the structure of Experiment 7 (as I'm calling the work described in your fax of May 20) rather than just exchange voice mail messages.

For your consideration, I've revised the structure of Experiment 6, per the discussions of last week, which included yourself, myself, and Dr. Ruth Brain. Please note that I've reduced the total wafer requirement to 15 wafers, as we had tentatively agreed. The structure of the experiment is 'analyzable' with a standard statistics package. I'd like to have all fifteen wafers available at the outset of the work, but will understand if you prefer to send only wafers # 11 - 14 initially to provide a few set-up runs and gauge feasibility. Even if you send all wafers together, my intention is to run only these few wafers first; if initial results are completely lacking in promise, I would stop before consuming the remainder to no purpose.

Thanks. If for any reason we miss speaking to each other this afternoon, I hope you have a great Memorial Day holiday.

Best Regards,

  
Tom Taylor

EXHIBIT

1054

*Page 1 of 2*

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ST003062

## Experiment 6

Rev. 2

5/23/97

Wafer #	Seed Layer Thickness	Electroless Cu Thickness	Post-processing
1	500	500	SEM section after Electroless
2	"	"	Electroplate 1.0 micron Cu; SEM section
3	500	1000	SEM section after Electroless
4	"	"	Electroplate 1.0 micron Cu; SEM section
5	1000	500	SEM section after Electroless
6	"	"	Electroplate 1.0 micron Cu; SEM section
7	1000	1000	SEM section after Electroless
8	"	"	Electroplate 1.0 micron Cu; SEM section
9	750	500	Electroplate 1.0 micron Cu; SEM section
10	"	"	
11	750	750	SEM section after Electroless
12-14	"	"	Electroplate 1.0 micron Cu; SEM section
		x3	
15	750	1000	Electroplate 1.0 micron Cu; SEM section

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Page 2 of 2

# Exhibit M

# SEMITOOL®

## Metallization Process Group

655 West Reserve Drive, PO Box 7010, Kalispell, MT 59904 Phone: 406-752-2107 Fax: 406-752-5522

### FAX COVER SHEET

To: Dr. Shu Jin / Intel

Fax# (408) 765-2949

From: Tom Taylor

Phone#: 406-752-2107

Fax#: 406-755-3226

Date: May 27, 1997

Subject: Experiment 6 / Rev 2

Pages Including Cover: 2

---

***[Following text is copied from a fax originally transmitted on Friday, May 23, but not received]***

Hello, Shu.

Hopefully we'll get a chance to talk about the structure of Experiment 7 (as I'm calling the work described in your fax of May 20) rather than just exchange voice mail messages.

For your consideration, I've revised the structure of Experiment 6, per the discussions of last week, which included yourself, myself, and Dr. Ruth Brain. Please note that I've reduced the total wafer requirement to 15 wafers, as we had tentatively agreed. The structure of the experiment is 'analyzable' with a standard statistics package. I'd like to have all fifteen wafers available at the outset of the work, but will understand if you prefer to send only wafers # 11 - 14 initially to provide a few set-up runs and gauge feasibility. Even if you send all wafers together, my intention is to run only these few wafers first; if initial results are completely lacking in promise, I would stop before consuming the remainder to no purpose.

Thanks. If for any reason we miss speaking to each other this afternoon, I hope you have a great Memorial Day holiday.

Best Regards,

Tom Taylor

EXHIBIT

10516

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ST020769

Recommended experimental strategies

- 1) Follow-up on incremental deposition work. Should include pre-plating SE section of seed layer thickness. Recommend 1500A Cu on Ta or TaN barrier.

(20 wafers)

Concentration on FWD pulse plating

Deposition thicknesses of :

1000 A DC, FWD, PR  
1500 A FWD  
2000 A DC, FWD, PR  
2500 A FWD  
3000 A DC, FWD, PR  
3500 A FWD  
4000 A DC, FWD, PR  
6000 A FWD  
8000 A DC, FWD, PR

- 2) Experiment to explore the interaction between pulse plating parameters and electrolyte chemistry.  
(50 wafers)

Bath 1 : Standard CU-BATH M with brighteners and levellers/suppressors

Bath 2 : CU-BATH M with brightening agents only (two concentrations, 50% & 100%)

Bath 3 : CU-BATH M with suppressors only (two concentrations, 50% & 100%)

Bath 4 : CuSO4/H2SO4 "Semitool Basic Bath"

Waveforms to include :

DC plating at two different current densities

FWD plating at two different conditions (modify pulse width/amplitude) and two time averaged current densities – preferably the same as employed for DC. One condition should be equivalent to the conditions previously used for Intel samples.

Pulse-reversed waveforms. Based on results obtained in STI DOE.

- 3) Experiment to determine if seed layer continuity on feature sidewalls can be supplemented with electroless Cu.

Barrier Material : Ta or TaN, 150A thickness

Seed layer thicknesses : 500A, 1000A, 1500A

Number of wafers per seed layer thickness : 15

Total number of wafers : 45

Electroless deposition process targets : Add 500A, 1000A, 1500A of Cu (5 wafers each per seed thickness)

Bath Type	Pwr Type	Current	Trench Width	Observations
1	DC	6.2	0.5 0.6 0.7 0.75 0.8 0.85 0.9 0.95 1	High central void Central seam Smooth surface Smooth surface Closed at throat Open at throat Smooth surface Conformal
	DC	9	0.55 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1	Central seam and gross bottom void Central seal and minor bottom void Central seam Closed at throat High central seam Central seam Open at throat Conformal
	PR	6.2	0.55 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1	Central "pearl-string" voids Smooth surface Some sidewall voids Central seam Open at throat Large central seam Less conformal than DC
	PR	9	0.55 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1	Central "pearl-string" voids Smooth surface Sidewall voids Central seam/voids Closed at throat Just open at throat Wider central seam Larger opening at throat More conformal than 6.2A PR, less than DC
	FWD	6.2	0.55 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1	Central "pearl-string" voids Smooth surface Sidewall voids Small central seam Throat closed, but creased High central seam Just open at throat Appearance very similar to DC
	FWD	9	0.55 0.65 0.7 0.75 0.8 0.85 0.9 0.95 1	Appearance very similar to DC



Bath Type	Pwr Type	Current	Trench Width	Observations
2	DC	6.2	0.5	Central void
			0.6	Central void/seams
			0.7	Central seam
			0.75	Closed at throat
			0.8	Smooth surface
	DC	9	0.8	Few sidewall voids
			0.85	Closed at throat
			0.9	Just open at throat
			0.95	Smooth surface
			1	Smooth surface
	PR	6.2	0.55	Gross sidewall/bottom voids
			0.65	Central seam and minor sidewall/bottom void
			0.7	Closed at throat
			0.75	Central seam
			0.8	Central "pearl-string" v
	PR	9	0.85	Open at throat
			0.9	Conformal
			0.95	Conformal
			1	Conformal
	FWD	6.2	0.55	Central "pearl-string" voids
			0.65	Smooth surface
			0.7	Open at throat
			0.75	Less conformal than DC
			0.8	Less conformal than DC
	PR	9	0.85	Less conformal than DC
			0.9	Less conformal than DC
			0.95	Less conformal than DC
			1	Less conformal than DC
	FWD	6.2	0.55	Central seam/voids
			0.65	Smooth surface
			0.7	Closed at throat
			0.75	Just open at throat
			0.8	Larger opening at throat
	FWD	9	0.85	Same as 6.2A PR
			0.9	Same as 6.2A PR
			0.95	Same as 6.2A PR
			1	Same as 6.2A PR
	FWD	6.2	0.55	Slight central voids
			0.65	Central seams
			0.7	Central seams
			0.75	Central seams
			0.8	Central seams
	FWD	9	0.85	Larger central seam
			0.9	Just open at throat
			0.95	Open at throat
			1	Open at throat
	FWD	6.2	0.55	Appearance very similar to DC
			0.65	Appearance very similar to DC
			0.7	Appearance very similar to DC
			0.75	Appearance very similar to DC
			0.8	Appearance very similar to DC
	FWD	9	0.85	Appearance very similar to DC
			0.9	Appearance very similar to DC
			0.95	Appearance very similar to DC
			1	Appearance very similar to DC
	FWD	6.2	0.55	Appearance very similar to DC
			0.65	Appearance very similar to DC
			0.7	Appearance very similar to DC
			0.75	Appearance very similar to DC
			0.8	Appearance very similar to DC

Bath Type	Pwr Type	Current	Trench Width	Observations
3	DC	6.2	0.55	Large central seam
			0.65	Thick Cu on mesa
			0.7	Central seam
			0.75	Open at throat
			0.8	Nonconformal dep; thick on mesa
			0.85	Seam terminates at half trench height
			0.9	Nonconformal, with re-entrant
			0.95	Re-entrant
			1	Re-entrant
			0.55	Large central seam
			0.65	Large divit
			0.7	Divit / "pinch-off"
			0.75	Nonconformal
			0.8	Slight re-entrant
0.85	Seam terminates at two-thirds height			
0.9	Seam terminates at half height			
0.95	Seam terminates at half height			
1	Low central void			
	PR	6.2	0.55	Central seam
			0.65	Rougher surface
			0.7	Sidewall voids
			0.75	Large surface divit
			0.8	Closed at throat
			0.85	Just open at throat
			0.9	Open at throat; nonconformal
			0.95	Seam terminates at two-thirds height
			1	Seam terminates at half height
			0.55	Central "pearl-string"
			0.65	Rougher surface
			0.7	Closed at throat
			0.75	Non-conformal(?)
			0.8	Large divit
0.85	Larger opening at throat			
0.9	Seam terminates at 3/4 height			
0.95	Seam terminates at two-thirds height			
1	Seam terminates at two-thirds height			
	FWD	6.2	0.55	Large central voids (low, triangular)
			0.65	Large divit / "pinch-off"
			0.7	Open at throat
			0.75	Non-conformal; thick on mesa
			0.8	Re-entrant
			0.85	Very re-entrant
			0.9	Keyholed
			0.95	Keyholed
			1	Keyholed
			0.55	Large central seam
			0.65	Open at throat
			0.7	Open at throat
			0.75	Open at throat
			0.8	Open at throat
0.85	Open at throat			
0.9	Open at throat			
0.95	Open at throat			
1	Open at throat			
	FWD	9	0.55	Large central voids (low, triangular)
			0.65	Large divit / "pinch-off"
			0.7	Open at throat
			0.75	Non-conformal; thick on mesa
			0.8	Re-entrant
			0.85	Very re-entrant
			0.9	Keyholed
			0.95	Keyholed
			1	Keyholed
			0.55	Large central seam
			0.65	Open at throat
			0.7	Open at throat
			0.75	Open at throat
			0.8	Open at throat
0.85	Open at throat			
0.9	Open at throat			
0.95	Open at throat			
1	Open at throat			

Bath Type	Pwr Type	Current	Trench Width	Observations
4	DC	6.2	0.55	Large central seam
			0.65	Central seam
			0.7	"Pearl-string"
			0.75	Central seam
			0.8	"Pearl-string"
			0.85	Central void cloud
			0.9	"
			0.95	"
			1	Open at trench mouth, very non-conformal (thick at trench bottom) Re-entrant
			0.55	Central seam
			0.65	Gross dendrites
			0.7	Gross bottom/sidewall voids
			0.75	Very thin on mesa
			0.8	Dendrites centered on trenches
PR	PR	6.2	0.55	Central seam
			0.65	Spiky dendrites
			0.7	More conformal (?)
			0.75	Just open at throat
			0.8	Triangular opening at throat
			0.85	Large triangular opening at throat
			0.9	"
			0.95	Spiky, globular dendrites
			1	Thin Cu, but conformal
			0.55	Central seam
			0.65	Small spiky dendrites
			0.7	Closed at throat, but with diwit
			0.75	Large triangular diwit at throat
			0.8	"
FWD	FWD	6.2	0.55	Deep central seam
			0.65	"
			0.7	"
			0.75	"
			0.8	"
			0.85	"
			0.9	"
			0.95	"
			1	"
			0.55	"Pearl-string" voids
			0.65	Rougher surface; dendrites(?)
			0.7	Small spiky dendrites
			0.75	Rougher surface
			0.8	Porous Cu
FWD	FWD	9	0.55	Conformal; closed at throat
			0.65	"
			0.7	"
			0.75	"
			0.8	"
			0.85	"
			0.9	"
			0.95	"
			1	"
			0.55	Central seam
			0.65	Just closed at throat
			0.7	"
			0.75	"
			0.8	Just open at throat

Bath Type	Pwr Type	Current	Trench Width	Observations	Smooth surface	Slightly thicker on mesa	
5	DC	6.2	0.55	High central seam	-	-	
			0.65	Slight central seam	-	-	
			0.7	Slight central seam	-	-	
			0.75	No seam visible	-	-	
			0.8	-	-	-	
	DC	9	0.85	-	-	-	
			0.9	-	-	-	
			0.95	-	-	-	
			1	No seam; completely filled	-	-	
			0.55	High central seam	Smooth surface	Slightly thicker on mesa	
	PR	6.2	0.65	Central seam	-	-	
			0.7	Slight central seam	-	-	
			0.75	No seam visible	-	-	
			0.8	High central "voidlet"	-	-	
			0.85	No seam visible	-	-	
	PR	9	0.9	Central "voidlet"	-	-	
			0.95	-	-	-	
			1	No seam; completely filled	-	-	
			0.55	Central seam	Open at throat	Smooth surface; conformal dep	
			0.65	"Pearl-strings"	Just closed at throat	-	
	FWD	6.2	0.7	Central seam	Open at throat (half filled)	-	
			0.8	-	One-third filled	-	
			0.85	-	-	-	
			0.9	-	One-fourth filled	-	
			0.95	-	-	-	
	PR	9	1	-	-	-	
			0.55	Central seam	Open at throat	Smooth surface; conformal dep	
			0.65	"Pearl-strings"	Just closed at throat	-	
			0.7	"Voidlet"	Closed at throat	Dwelt at throat	
			0.75	No voids visible	-	-	
	FWD	6.2	0.8	No voids visible	3/4 Filled	Large divit	
			0.85	-	2/3 Filled	-	
			0.9	-	1/2 filled	Slightly thinner on sidewalls	
			0.95	-	1/3 filled	-	
			1	-	-	-	
		FWD	9	0.55	High central seam	Smooth surface	Slightly thicker between mesas
				0.65	-	-	-
				0.7	No seam visible	-	-
				0.75	-	-	-
				0.8	-	-	-
			0.85	-	-	-	
			0.9	-	-	-	
			0.95	-	-	-	
			1	-	-	-	
			0.55	High central seam	Smooth surface	Slightly thicker between mesas	
			0.65	-	-	-	
			0.7	-	-	-	
			0.75	-	-	-	
			0.8	-	-	-	
			0.85	-	-	-	
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		
		0.8	-	-	-		
		0.85	-	-	-		
		0.9	-	-	-		
		0.95	-	-	-		
		1	-	-	-		
		0.55	High central seam	Smooth surface	Slightly thicker between mesas		
		0.65	-	-	-		
		0.7	-	-	-		
		0.75	-	-	-		

Experiment #	Dates	# Wafers	Wfr Size	Purpose	Conclusions
6	Early June	15	200mm	Seed supplement with electroless Cu Seed thicknesses of 500Å, 750Å, 1000Å Electroless Cu thickness of 500Å - 1000Å Electrolytic dep of 1.0µm	Pending; first 'set-up' wafers arrived at STI 6/2/97
7	TBD	TBD	200mm	Evaluation of low-frequency pulse Form of in-situ electropolish Relies on dep-etch sequence	Pending
8	05/12/1997	12	150mm	Evaluation of FWD, DC, PR waveforms Blanket and patterned wafers, TIN Barrier Other purposes unknown to STI	Waiting results
9	05/16/1997	18	200mm	Investigation of CVD Cu seed (500Å - 1500Å) Pre-clean' splits prior to barrier/seed DC/FWD, PR waveforms	Waiting results
10	05/28/1997	10	200mm	DOE over the factors of Waveform (FWD, PR) Peak Current (4.5, 5.3, 6.2A) Bath temp (15, 20, 25 deg. C) Brightener Conc. (50, 100, 150%)	Waiting results
11	06/03/1997	9	200mm	Evaluation of DC, FWD, PR TIN Barrier	Pending

Total Wafers to Date :

165

# Hardware Generation Roadmap

## Semifool Cu ECD Systems

	Feasibility/Development Tools 1995 -> 1996	IRONMAN Tool Generation 1 1996 -> 1997	Production Tool Generation 2 1997 -> 1998	300mm ECD 1998 -> 1999	300mm ECD 1999 -> 2000	300mm ECD 2000 -> 2001
Flow Rate Range	2 - 6 gpm	2 - 9 gpm	1 - 10 gpm	1 - 10 gpm	1 - 10 gpm	1 - 10 gpm
Flow Variation Chamber-to-chamber	0.5 gpm	0.5 gpm	0.2 gpm	0.2 gpm	multi-step programmable 0.1 gpm	multi-step programmable 0.1 gpm
Electrolyte Temperature	25 +/- 5 deg. C	25 +/- 5 deg. C	40 +/- 20 deg. C	40 +/- 20 deg. C	40 +/- 20 deg. C	40 +/- 20 deg. C
Max. Temperature Variation Chamber-to-chamber	5 deg. C	5 deg. C	5 deg. C	2 deg. C	1 deg. C	1 deg. C
Power Supply Range Continuous/Peak	30A / 100A Endpoint on integrated current	30A / 100A Endpoint on integrated current	TBD Endpoint on integrated current	TBD Cell conductance monitor Endpoint on integrated current	TBD Cell conductance monitor Endpoint on plated thickness Sealed/Remote	TBD Cell conductance monitor Endpoint on plated thickness Sealed/Remote (seed layer enhancement)
Contact Type	Uncoated	Uncoated	Coated	Coated		
Contact Resistance Sensing	None	None	None	In-situ cell voltage sensing	In-situ contact resistance sensing	In-situ contact sensing and biasing
Bath Analysis/ Replenishment	None	Off-line analysis Manual replenishment	Off-line analysis Open loop replenishment	On-line analysis Open-loop replenishment	On-line analysis Feedback-controlled replenishment	On-line analysis Feedback-controlled replenishment
Wafer / Electrolyte Interface Control	Meniscus plating Manual Set-up	Meniscus Plating Manual Set-up	Meniscus plating Metered Stops	Meniscus plating Metered Stops Electrolyte contact sensing	Meniscus plating Programmable stops Electrolyte contact sensing	Wtr edge & backside protection Programmable stops Electrolyte contact sensing
Fluid Flow Path	Anode perimeter	Anode perimeter	Anode perimeter	Anode perimeter	Anode/chamber perimeter	Anode/chamber perimeter
Anode Configuration	Inert anode	Consumable anode	Consumable anode w/ shield	Consumable anode w/ shield	Consumable anode	Consumable anode
Auxiliary Electrodes	None	None	Auxiliary cathode Single segment	Auxiliary cathode Multi-segment	Optimized configuration Auxiliary cathode Multi-segment	Optimized configuration Auxiliary cathode Multi-segment
Diffuser type	Perforated plate	Perforated plate	Perforated plate	Alternative materials Mesh-type	Mesh-type, or none	Mesh-type, or none
Electrolyte Filtration	In-line	In-line	In-line	In-line plus point-of-use	In-line plus point-of-use	In-line plus point-of-use

1:133 nm

ECO ONLY 341-8

D:28,000x  
P:10,100x

3.00 kV

1  $\mu$ m

SEM1TOOL

#0001

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ST003070

ECD ONLY 341-10

Subject to Court Protective Order  
Do Not Copy or Disclose

D: 28,000x  
P: 10,100x

3.00 kV 1  $\mu$ m

SEM1 TOOL

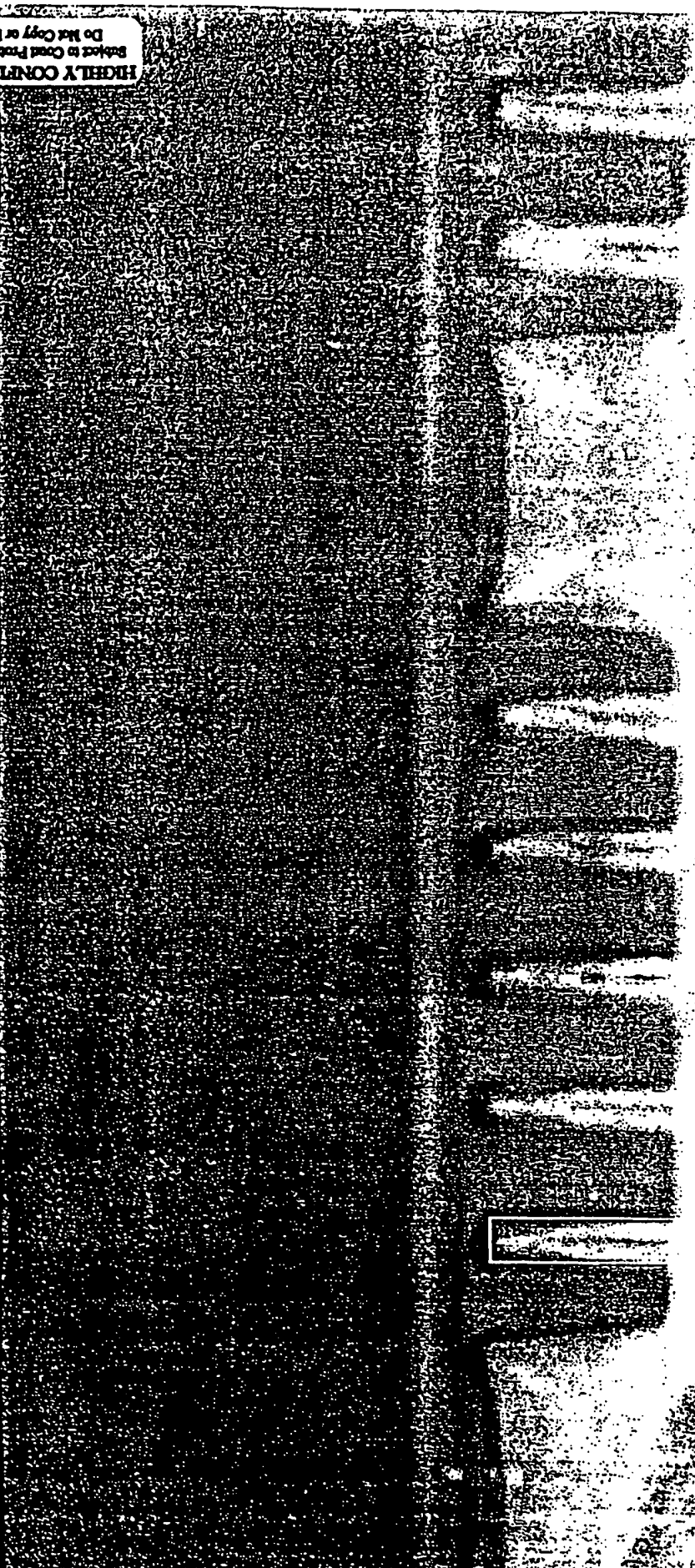
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ST003071



M: 0.385 H: 1.5 D: 1.54  $\mu$ m

NO CLEAN BEFORE E-LESS-4



D: 27,000x  
P: 10,000x

3.00 kV  $\frac{1}{1} \mu$ m

SEMITOOL

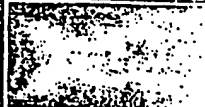
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ST003069

M: 0.73 H: 1.42 D: 1.6  $\mu\text{m}$

NO CLEAN BEFORE E-LESS-3



ST003068

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D: 27, 800x  
P: 10, 000x

3.00 kV

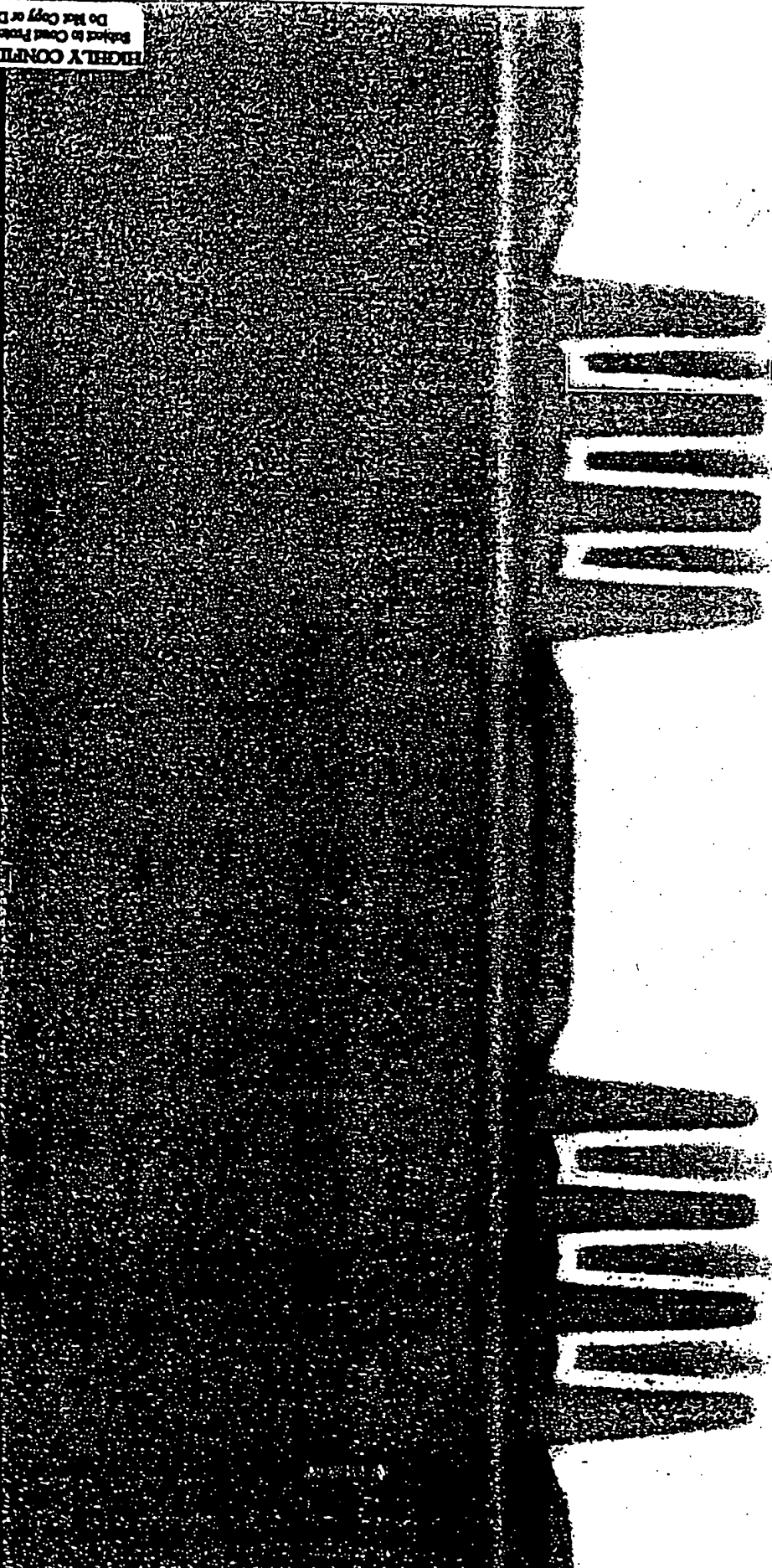
$\frac{1}{\mu\text{m}}$

SEM100L

#0001

0.342 H:1.52 D:1.56  $\mu$ m

750 ELE55-5



D:28,000x  
P:10,100x

3.00 kV

1  $\mu$ m

SEM1 TOOL

#0001

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ST003067

250 E-LESS-2

M:21.3 H:142 D:256 mm



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D:60,000x  
P:21,600x

5.00 kV 1  $\mu$ m

SEMIT00L

#0001

ST003066

wafer exhibit some voids on the walls of the trenches which may be characteristic of seed layer discontinuities, particularly near the bottoms of the trenches.

As a result of the SEM photographs obtained of wafer 381 in which the seed layer and electroless layer were distinguishable by a small barrier, wafers 383 and 387 were prewet for 10 sec in the acid copper make-up solution and then run in an SRD to remove any oxide that may have been present. It is suspected that this prewet step had a negative effect on the electroless and ECD steps as the 10 sec prewet may have removed portions of the existing seed layer to an extent where enhancement through electroless plating was not effective. Photographs labeled SEM 7 and 8 are of voids in the trenches of wafers 383 and 387 respectively. Wafer 387 has the largest voids of the two wafers.

**Summary:**

Electroless plating was used to enhance the seedlayer of four experimental wafers with some success. The SEM photographs taken of the electroless layer show a uniform enhanced seedlayer in all size trenches and vias. The ECD in combination with the electroless deposition also exhibits good filling capabilities with the exception of pin-holes structures in the smallest trenches and vias.

If you have questions regarding this experiment or future electroless plating experimentation, I can be reached by phone here at Semitool at (406) 752-2107 ex. 7271.

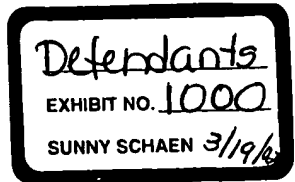
Best Regards,

Matt Johnson



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ST003065



# SEMITOOL®

## Advanced Technology Process Group

655 West Reserve Drive, PO Box 7010, Kalispell, MT 59904 Phone: 406-752-2107 Fax: 406-752-5522

To: Shu Jin, Chun Mu (INTEL)  
From: Matt Johnson  
Date: 6/30/97  
Subject: Seedlayer enhancement through electroless plating.  
cc: Henry Stevens, Bob Berner, Jeff Turner, Linlin Chin

### Experiment:

Investigation of electroless plating in combination with ECD for trench/via filling applications.

### Process Details:

The electroless bath used was a basic copper sulfate solution with formaldehyde and EDTA used as activation agents. The ECD was performed using a standard commercially available copper make-up solution and a forward only pulse type wave form. Five wafers were plated and the resulting deposition was observed using SEM photography. The following table is a summary of the plating processes used for each wafer.

wafer ID	electroless (Å)	ECD (µm)	prewet
335	750	1.5	no
341	no	1.5	no
381	750	no	no
383	750	1.5	yes
387	1500	1.5	yes

Wafer 381 was initially plated using the electroless deposition only for a total bath time of 2.5 minutes. Photographs labeled SEM 1 and 2 are of this wafer and show an even deposition layer covering the trenches and vias that is approximately 750 Å. The sputtered copper layer and the electroless copper layer can also be distinguished in the photographs.

Wafer 335 was also electroless plated to the nominal thickness of 750 µm and then plated using ECD. Photographs labeled SEM 3 and 4 are of this wafer. The structures on this wafer larger than approximately 0.7 µm wide were well filled with no voids. Trenches less than 0.7 µm wide appear to have developed pin-hole structures as a result of the trenches being shut off before complete deposition has occurred.

Wafer 341 was electroplated only and also appears to have good filling characteristics in the larger trenches as shown in photographs SEM 5 and 6. Some of the smaller structures on this

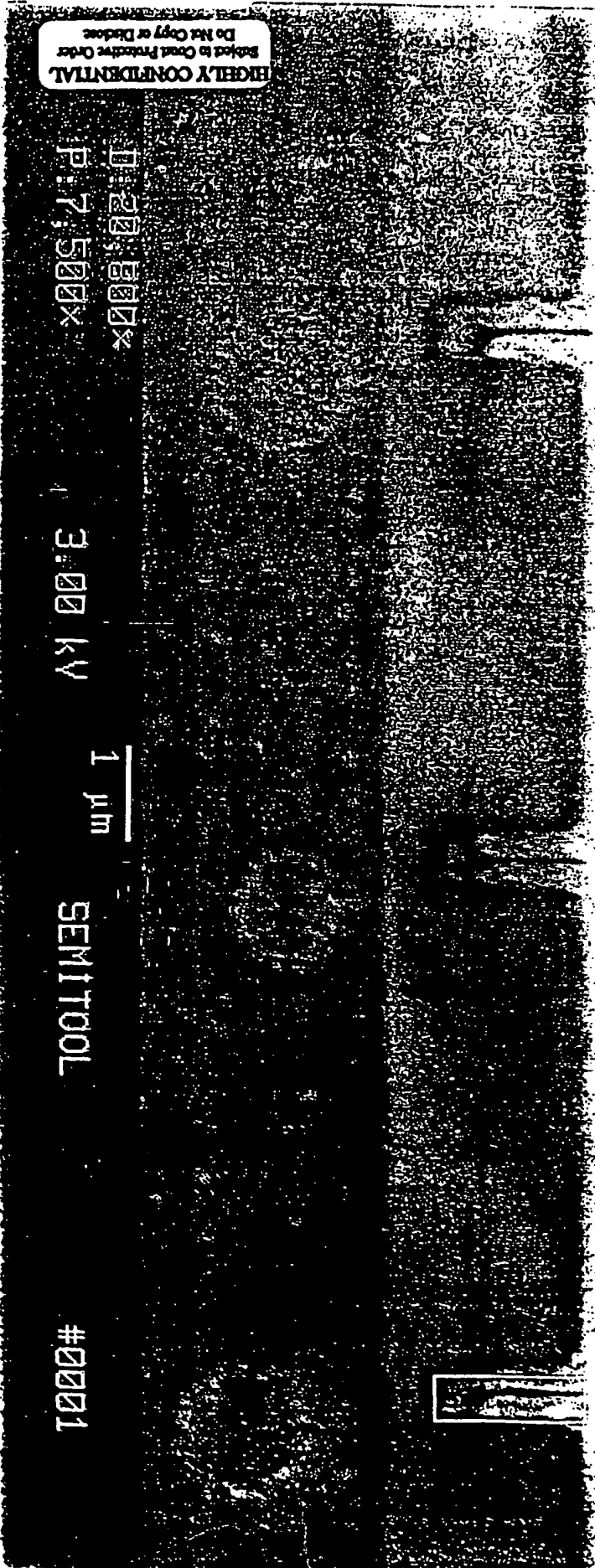
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ST003064

# Exhibit N

10:45:59 H:1.59 D:1.65  $\mu$ m

BEFORE E-LESS-1



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0:20:00x

P:7,500x

3.00 kV

1  $\mu$ m

SEM1TOOL

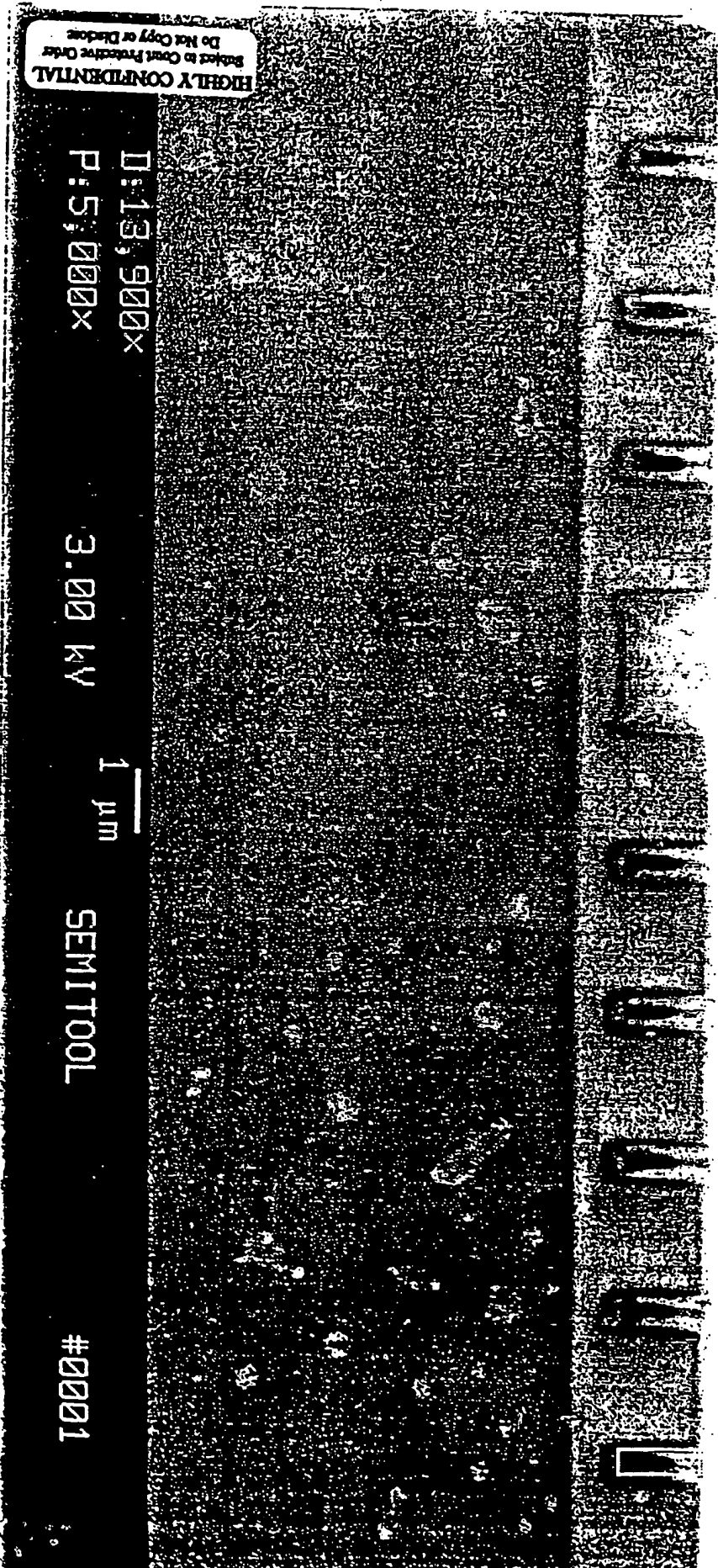
#0001

ST003072



NO. 422 H: 1.31 D: 1.37  $\mu$ m

NO. E-LE55-335-4



D: 13,900x

P: 5,000x

3.00 kV

1  $\mu$ m

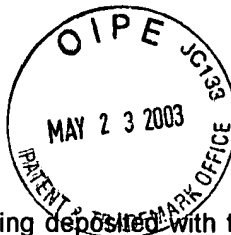
SEM1TOOL

#0001

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ST003073

# Exhibit O



Attorney Docket No. 291958171US02  
Semitool Ref No. P98-0025US3

Express Mail Label \_

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as Express Mail No. EL099017980US in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C., 20231, on:

Date: \_\_\_\_\_

By: \_\_\_\_\_

Melody J. Almberg

**PATENT**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN RE PATENT APPLICATION No.: 6,197,181  
APPLICATION No.: 09/045,245  
FILED: MARCH 20, 1998  
ISSUED: MARCH 6, 2001  
FOR: **METHOD FOR ELECTROLYTICALLY  
DEPOSITING METAL ON A  
MICROELECTRONIC WORKPIECE**

**Declaration of Harry M. Cross, Jr. In Support of Joint Inventorship**

1. I, Harry M. Cross, Jr., am Corporate Counsel of Semitool, Inc. (Semitool) located in Kalispell, Montana.

2. Based upon recently discovered documentary evidence, and recent statements from Mr. Thomas Taylor (Taylor) and Mr. Lin Lin Chen (Chen), Taylor is a co-inventor of (a) certain subject matter claimed U.S. Patent No. 6,197,181 ("the '181 Patent") and (b) subject matter claimed in U.S. Application No. 10/302,711 as set forth in the Preliminary Amendment filed on November 22, 2002.

3. In April 1997, Taylor was a team leader within the Advanced Technology Group ("ATG") of Semitool, and he was involved with developing new technologies for improving seed layers.

4. On April 4, 1997, the Semitool ATG group held a meeting that included a discussion of Semitool's current developments in seed layer technology. During this

meeting, Taylor presented information about Semitool's efforts to improve and optimize seed layers by using an electroless process to perform seed layer enhancement. According to Taylor, the seed layers to be enhanced were thin seed layers in the range of 200-500Å, and the purpose of the electroless enhancement process was to fix deficiencies (i.e., voids and discontinuities) in the seed layer before using an electroplating procedure to bulk fill copper on the seed layer.

5. After April 4, 1997, Taylor designed experiments to demonstrate the electroless enhancement process to Intel Corporation (Intel). On May 1, 1997, Taylor sent a confidential memorandum to Intel regarding his proposal to supplement the step coverage of PVD seed layers by a short electroless copper deposition process before beginning electrolytic plating. Between May 1 and June 30, 1997, Semitool performed the electroless seed layer enhancement experiments designed by Taylor.

6. Semitool prepared a confidential report dated June 30, 1997, regarding the experiments designed by Taylor. The results of these experiments established that the electroless process designed by Taylor was effective in eliminating deficiencies in seed layers for structures having a width larger than approximately 0.7 µm.

7. Although the electroless procedures designed by Taylor successfully repaired defective seed layers with certain characteristics, and although they also showed promise of greater success with further development, Semitool decided to devote its resources to other priorities.

8. Chen, the sole inventor named in the '181 Patent, began working for Semitool on April 14, 1997. Chen was not present at the ATG group meeting on April 4, 1997, but he later received a copy of the June 30, 1997, report describing Taylor's electroless seed layer enhancement experiment. Chen received a copy of this report to bring him up to speed on Semitool's current activities regarding seed layers and to solicit his feedback for improvements regarding Semitool's research and development activities.

9. In the middle of 1997, Taylor transferred from the Semitool ATG group to the Semitool marketing department. Taylor did not have direct involvement with developing processes for enhancing seed layers after this time.

10. In September 1997, I joined Semitool as a part-time consultant for three days a week.

11. In November 1997, Mr. Robert Berner, Corporate Vice President of Technology for Semitool, terminated his employment with Semitool to work for a different company. Although Mr. Berner was made aware of Taylor's previous work regarding electroless processing of seed layers, he did not inform me of Taylor's earlier work in the short time that we were both at Semitool. Also, after leaving Semitool, Berner was not available to assist me in coordinating the intellectual property of Semitool.

12. In late 1997, Chen began focusing on methods to fix deficiencies in seed layers. On December 22, 1997, Chen conceived of an electrolytic seed layer repair process, which is the preferred embodiment of the invention described in the '181 Patent.

13. The application for the '181 Patent was filed on March 20, 1998. Although certain claims in the '181 Patent cover electroless processing of a deficient seed layer, Taylor was inadvertently not named as an inventor on the application for the '181 patent.

14. On May 1, 1998, after (a) Taylor had transferred to marketing, (b) Berner had left Semitool, and (c) the application for the '181 Patent had been filed, I became a full-time employee of Semitool and assumed full responsibility for Semitool's intellectual property. Because of the personnel and organizational changes at Semitool involving Taylor and Berner in mid to late 1997, and also because of my being a part-time consultant from September 1997 to May 1, 1998, Semitool simply inadvertently lost track of the work that Taylor and Semitool had performed using an electroless process to enhance deficient seed layers.

15. I only recently became aware and confirmed that Taylor had made an inventive contribution to seed layer the repair processes covered in certain claims of '181 Patent and U.S. Application No. 09/694,413.

16. After allowance of several claims in U.S. Application No. 09/694,413, Semitool cancelled claims in that application which were jointly invented by Taylor and Chen, and only allowed subject matter invented solely by Chen to proceed to allowance.

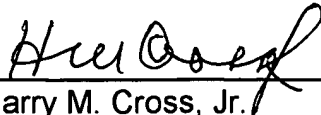
17. Semitool is pursuing the allowed and subsequently cancelled claims from U.S. Application No. 09/694,413 that were jointly invented by Chen and Taylor in U.S. Application No. 10/302,711.

18. Based on the foregoing, the error in inventorship of failing to name Taylor as a joint inventor of certain claimed subject matter of the '181 Patent occurred without any deceptive intention on the part of Taylor, Chen or others involved with the prosecution of the '181 Patent or U.S. Application No. 09/694,413.

19. I declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further, that all statements were made with the knowledge that making willfully false statements and the like is punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing from this patent application.

This Declaration is executed on the \_\_\_\_ day of May, 2003.

Date: 5/22/03

  
\_\_\_\_\_  
Harry M. Cross, Jr.  
Registration No. 22,229

**Correspondence Address:**

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Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
(206) 583-8888